Phase I Regional Investigation Report

AMERICAN SMELTING AND REFINING COMPANY (ASARCO)

Conducted April 11 & 20, 2006

Submitted by TCEQ Investigation Team
April 28, 2006

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Attachments:

A. Site Map
B. ASARCO Process Description Figures
C. Photographs
D. ASARCO El Paso Copper Smelter Startup Plan

I. PURPOSE AND SCOPE OF INVESTIGATION

Pursuant to the interim order issued March 10, 2006, regarding ASARCO's air permit renewal, the Executive Director (ED) was directed, under Ordering Provision No. 3, to conduct a vigorous investigation of all air quality control equipment and related practices at the El Paso Plant. The ED was directed to assess the sufficiency of existing plant control equipment and practices as well as the appropriateness of a permit amendment application rather than a renewal application for equipment that has not been previously authorized or that requires repair or replacement.

In order to accomplish this, a TCEQ investigative team was formed and led by the El Paso Regional office to conduct investigations designated as Phase I. Phase I focused on the status and general condition of process and control equipment relative to warm/temporary versus cold/permanent shutdown. Phase II, review by the process engineer, will concentrate on the condition and effectiveness of existing emission control equipment due to the extended suspension of operations.

The goals for the Phase I investigation are to observe and evaluate the following:

1) Presence and condition of process equipment;
2) Presence and condition of abatement equipment;
3) Presence and condition of ancillary and support equipment necessary for operation;
4) Maintenance and care activities/procedures conducted during suspended operations; and
5) General deficiencies, requiring equipment repair, modification, and/or replacement for plant restart.

The Phase I investigation team was comprised of senior Regional and Central Office staff.

On April 10, 2006, the investigation team (team) met in the Region 6 office to discuss the scope of the investigation and to finalize the investigation plan. On April 11, the team commenced its investigation using a detailed plant process description to assure complete and comprehensive coverage of facilities. The plant process description is a detailed narrative describing the copper circuit processes, including associated abatement and process equipment, submitted as part of the permit application. This plant process description along with the air quality permit (including modification through permit amendments and/or alterations), represents the physical operations, equipment, and processes authorized and/or required by the permit. The information gathered and observations made during the investigation were compared with the process description and air permit and reported as "observations" in each section of this report. ASARCO personnel were present during the investigation only for the purpose of responding to questions and providing specific information regarding plant operation and equipment.

II. BACKGROUND

The El Paso Plant, originally founded as a lead smelter in 1887, is one of the oldest non-ferrous smelters in the United States. A copper smelter was added in the early 1900s, and a Godfrey roaster for cadmium production was added in the 1930s. The blast furnace and slag fuming plant for zinc recovery was constructed in 1948. ASARCO added an antimony plant in 1976 and a sinter plant and unloading and bedding systems in 1979. The El Paso Plant no longer processes lead, zinc, antimony or cadmium as indicated below:

Zinc plant shut down/demolished - 1983
Lead plant shut down/demolished - 1985
Antimony plant shut down - 1986
Cadmium plant shut down/demolished – 1994.

In 1993, ASARCO modernized the El Paso plant by replacing century-old smelting methods (reverberatory furnace) with new ConTop reactors, which is an abbreviated reference to Continuous Top-feed Oxygen Process. In this process, dried concentrates are fed in a swirling pattern into two reactors above a holding furnace in the presence of oxygen. This process provides for a continuous feed of concentrates, rather than in batches, of roasted calcines, brought in by "larry cars," and utilizes oxygen rather than air, which greatly reduces off-gas volume and NO_X. This process generates a consistently strong sulfur dioxide (SO_2) gas stream, resulting in a more efficient acid plant operation. As a result, ConTop provided significant reductions in all pollutants emitted by the smelting process. The ConTop project required modifications of existing facilities and major construction of new facilities. Under ConTop technology, ASARCO proposed to increase anode production from 120,000 tons to 152,000 tons per year (tpy) (based on processing 361,000 tons of concentrates and 24,000 tons of scrap).

Smelter modifications under ConTop started with the belt conveyor system from the bedding building and ended at the converter furnaces. The unloading and bedding buildings are a separate yet integral part of the operation authorized under Permit No. 4151. From startup in 1993 to shut down in 1999, ASARCO continued to make improvements/modifications to the ConTop system as knowledge and experience increased with use of the new technology.

In February 1999, the plant was temporarily shut down due to low copper prices. Company officials initially reported that the suspension of operations was temporary and not expected to exceed three years.

ASARCO submitted a permit renewal application on March 28, 2002. On April 28, 2004, the Commission decided to hold a hearing in the public interest and referred the application to the State Office of Administrative Hearing (SOAH) to address two issues: 1) Whether the operation of the El Paso Copper Smelter under the terms of the proposed permit will cause or contribute to a condition of air pollution; and 2) Whether the Applicant's compliance history for the last five years of operation of the El Paso Primary Copper Smelter warrant the renewal of Air Quality Permit no. 20345. SOAH conducted the hearing on the merits July 11-22, 2005 and a proposal for decision was issued on October 27, 2005 recommending denial of the permit. On February 8, 2006, the Commission did not deny the renewal but concluded that ASARCO failed to prove that it would meet the requirements for renewal of the permit and remanded the application to the ED pursuant to Texas Health & Safety Code § 382.055. As noted above, the March 10, 2006 Interim Order required, in part, that the ED conduct a vigorous investigation of all air quality control equipment and related practices. This Phase I Regional Investigation Report is the result of that investigation.

III. PLANT PROCESS DESCRIPTION AND OBSERVATIONS

The narrative that follows describes the copper circuit in detail (from the receipt of ores to the shipment of copper anodes) and includes a summary of observations in each major operational area.

Refer to ASARCO Site Map (Attachment A) for locations of sources indicated by an (*).

Solid Materials Streams

Ore receipt, unloading, storage, bedding, crushing and associated facilities are covered under Permit No. 4151. These facilities are used to receive, store and mix input materials (ores), including concentrates and fluxes. With the exception of the crushing plant (EPN - HF-12Si, Bk)*, all of these facilities up through the No. 5 belt (EPN - HF17 MIX)* were permitted in 1980 (TACB Permit No. R-4151). Therefore, all activities "upstream" of the No. 5 belt are not considered part of this investigation and are only mentioned for completeness.

Copper Mix Conveying Systems

After appropriate bedding to produce a metallurgical acceptable mix of ore, raw materials leave the bedding building on the No. 5 belt for conveyance to the process components of the smelter.

Concentrate Conveying

Copper concentrates and other feed materials are transferred from the permitted bedding operation, via the No. 4 and No. 5 belts. Although No. 4 and No. 5 belts and their transfer points (permitted in 1980) are outside the bedding building, they are in enclosed galleries. The copper mix, with a 10 percent moisture content, is transferred from the No. 4 to No. 5 conveyor in an enclosed gallery (HF-16 MIX)*, and then to a sieve, which separates oversize material from fine material. The oversized material passes to the "delumper" for size reduction, and thence onto the No. 10 conveyor (HF-17 MIX)* underneath the old ore storage bins. The coarse fraction is routed to a storage bin pending further processing in the converter building or in the crushing plant. The sieve and delumper station is completely enclosed and ventilated to a baghouse. Beyond the transfer point, the No. 10 belt itself is not covered due to the high moisture content of the ore, however each transfer point is completely enclosed. The copper mix is next transferred directly onto the No. 13 belt, and thence onto the No. 14 and 15 belts (HF-18A MIX, HF-18B MIX and HF-19 MIX)*. Belts No. 14 and No. 15 are located inside belt galleries, which consist of a roof, sides, and floor. The belt galleries have three-foot openings at eye level between the siding and roof on one side.

The No. 15 belt discharges onto the No. 30 conveyor (HF-20 MIX)*, which in turn empties onto belt No. 10.4 (HF-23)*. The transfer point is completely enclosed. Belt No. 10.4 empties to the wet concentrate storage bins B-1A (HF-24)* and B-1B (HF-25)*. The No. 30 and 10.4 belts are covered half around with corrugated metal, and the transfer points into bins B-1A and B-1B are enclosed. (Attachment B, Figure VI.A-2).

Converter Silica Conveying

Converter silica is similarly handled through the bedding building reclaim system and is transferred on the same belts as copper mixes. Silica leaves the bedding building on No. 4 belts. The converter silica at 4 percent moisture is transferred from No. 4 to No. 5 conveyor in the enclosed gallery (HF-16Si)*. The silica by-passes the delumper station and is transferred directly to No. 10 belt (HF-17Si)*. The silica is next transferred to No. 13 belt, and thence to No. 14 and 15 belts (HF-18A Si, HF-18B Si)*. As mentioned earlier, both belts, No. 14 and No. 15, are located inside galleries. The silica transfer point between No.5 belt and No. 10 belt is completely enclosed. All other transfer points are completely enclosed.

No. 15 belt discharges onto No. 30 conveyor (HF-20Si)*, which in turn empties into the converter silica silo (HF-21)*. The silo discharges onto No. 33 belt (HF-22)*, which is not covered. No. 33 belt discharges converter silica inside the enclosed and ventilated converter building. Belt No. 30 is covered half around with corrugated metal. (Attachment B, Figure VI.A-2).

Observations:

1) A portion of Belt 10 from the bedding building to the transfer point leading to the inclined conveyance has been removed to allow for the movement of construction equipment and vehicles during demolition of portions of the lead plant (now defunct), as well as current on-site remediation activities immediately adjacent to this area.

2) Transite panels (containing asbestos) on the east side of the Belt 10 inclined conveyance and portions of walls on all sides of the belt transfer gallery (Belts Nos. 13, 14, 15) were removed during the lead plant demolition activities.

3) All major components and equipment associated with this area, with the exceptions listed above, were intact and consistent with the plant process description.

Wet Concentrate Storage Bins

The two 250 ton wet (approximately 10 percent moisture) concentrate storage bins (Attachment B, Figure VI.A-8) empty onto two 36-inch open weigh feeders (HF-26 and HF-27)* at partially enclosed transfer points. These feeders then transfer concentrate from the storage bins onto an open 24-inch belt conveyor (HF-28 and HF-29)* at partially enclosed transfer points. Bin blasters facilitate flow of concentrates from the bins onto the weigh feeders. The 24-inch belt conveyor feeds the concentrate dryer. The discharge point is partially enclosed and a baffle arrangement and negative pressure from the dryer are designed to minimize emissions (HF-30)*.

Observation: All major components and equipment associated with this process were intact and consistent with the plant process description.

Fluid Bed Dryer and Product Baghouses

The fluid bed concentrate dryer reduces moisture content in the feed from about 10 percent to 0.5 percent. The dryer product is pneumatically conveyed to two cyclone separators, in parallel, which drop out 90 percent of the material from the gas stream. The drop-out material is pneumatically conveyed to the dry concentrate storage bins. The dried feed material not removed by the cyclone separators passes to the product baghouses for recovery.

The dried concentrate not removed from the gas stream by the cyclone separator is removed by the product baghouses (5 total), which is ventilated to the annulus of the existing 828-foot copper stack. The collected material is pneumatically conveyed to the dry concentrate storage bins.

The off-gases from the fluid bed dryer contain solids at 0.5 percent moisture, which pass to the two cyclone separators for 90 percent solids removal and then to the product baghouse for the remaining solids capture (Attachment B, Figure VI.A-12). The baghouse exhaust vents to the 828-foot copper stack annulus (CU/STK/AN)*. Compressors power a pneumatic system, which conveys cyclone and baghouse dust to the dry storage bins.

Observations:

1) The Continuous Opacity Monitoring System (COMS) cabinets have been sealed for protection against the elements. The COMS was observed on the flue exiting the fluid bed concentrate dryer baghouse and on the flue exiting the converter building ventilation baghouse.

2) All major components and equipment associated with this process were intact and consistent with the plant process description.

<u>Dry Concentrate Storage Bins</u>

Dried concentrate from the cyclone separator and the product baghouse is pneumatically conveyed to two surge hoppers feeding a pneumatic system to the two 400 ton dry concentrate storage bins (Attachment B, Figure VI.A-9). The bins are evacuated through bag filters to the converter building ventilation baghouse.

According to the process description which was revised through a permit alternation, effective April 17, 1994, the dry feed is bottom-discharged from the three storage bins (BIN B2A, B2B, B3B)* via six screw conveyors onto six feeder belts (HF-31)*. The feed is split onto a pneumatic conveying system to three pneumatic blowers (one for each of the two ConTop reactors), which supply feed to the cyclone reactors through a totally enclosed feed port.

The three 400 ton dry concentrate storage bins are enclosed. The displaced air from these bins is vented through bag filters, and then to the converter building ventilation baghouse (Figure VI.A-13). This baghouse discharges to the copper stack annulus. A baghouse ventilates the four weigh belt discharge points on the dry concentrate (reactor feed) distribution system, and also vents to the copper stack annulus through the converter building ventilation baghouse.

Observation:
All major components and equipment associated with this process were intact and consistent with the plant process description.

ConTop Cyclone Reactor System

The two cyclone or ConTop reactors, are attached to the top of the settling furnace (Attachment B, Figures VI.A-9 and VI.B-1). The dried concentrate is vertically injected into the cyclone reactors, where smelting takes place. The oxygen and natural gas are tangentially injected. Molten material gravity discharges from the reactors to the settling furnace below. This furnace, unlike the traditional reverberatory furnace, is not a smelting vessel, but is a holding and settling vessel for the molten product of the cyclone reactors.

In the new settling furnace, separate matte (bottom) and slag (top) layers form the same as in the traditional reverberatory furnace. Matte, averaging 58-60 percent copper, is periodically removed (or "tapped") through four tapping blocks (two on each side) into ladles for transfer to a converter. During tapping, the ladles are placed inside two enclosed matte tap tunnels, which vent to the converter building baghouse. A track and car system allows for movement of ladles in and out of the matte tap tunnels.

Slag is periodically skimmed from the matte through covered, exhaust-ventilated launders into slag pots (F-RSS)*. Local exhaust from skimming is ducted to the converter building ventilation baghouse. Slag pots are transported to the slag dump by diesel powered slag haulers. When operating, about 795 tons of slag is poured daily at the slag pour or deposit area.

Converter slag is charged to the smelting furnace through the hooded and ventilated slag return launder, which vents to the converter building baghouse and then to the copper stack annulus. "Reverts," consisting of matte ladle, slag shells, and converter aisle cleanup material, is taken to a grizzly screen located in the converter aisle inside the converter building. The fines are collected in a portable hopper, which are periodically emptied into the reverts feed bin above the furnace. Reverts are charged to the furnace through the enclosed reverts charge port on an apron feeder.

Three pneumatic blowers (one for each of the two reactors, one on standby) supply dried concentrate to the two reactors from the storage bins (Attachment B, Figure VI.A-13). The reactors are smelting vessels the off-gases from which are exhausted through the settling furnace below.

The exhaust gases from the new settling furnace pass through the waste heat boiler where a pressure drop causes dust to settle out. Waste heat boiler dust is collected in hoppers. The dust is drag-conveyed into portable tote boxes for transfer to the bedding building via truck (HF-14)*.

In-leakage of air at the furnace and boiler reduces the SO_2 gas strength to about 17 percent at the inlet to the hot gas fan. The off-gas predominantly ventilates to the No.2 acid plant, but may be routed to the No. 1 acid plant when necessary. With the built-in bypass capabilities, however, all or part of the ConTop process gases can be ducted to the No.1 acid plant. Conversely, all or part of the converter process gases can be taken to the No.2 acid plant for conversion to sulfuric acid.

Ventilation air from all potential sources of fugitive emissions from the ConTop reactor system (matte tapping tunnels, the slag skimming area, and the slag return launder) are ducted to the converter building ventilation baghouse. This baghouse, in turn, ventilates to the annulus of the copper stack.

Observation: All major components and equipment associated with this process were intact and consistent with the plant process description.

__Converter Operation__

One 13 by 30-ft. and two 13 by 35-ft. Pierce Smith converters are installed at the El Paso Plant. Each converter produces about 160 tons/day of blister (98 percent) copper. Following installation of the ConTop reactor system, the Plant was able to produce more copper but with only one converter in operation at any given time.

The makeup of each converter charge varies (Attachment B, Figure VI.A-10). Along with matte, other materials in the charge may include by-product dust, anode oxide slag, blister copper, and scrap copper. Because of the variety of materials in the converter charge, control of the metallurgy is critical to prevention of elevated levels of impurities in the blister produced.

Each of the converters has a number of tuyeres through which two automatic, 30,000 cubic feet per minute (ft^3/min) turbo blowers supply tuyere air. Totally pneumatic Gaspe punchers are used for tuyere punching. The converter operation involves the following steps:

> **Charging the converter with molten matte:** Matte (60 percent copper) from the cyclone smelting furnace is charged or poured into the mouth of the converter using a 20 ton ladle and overhead crane. During charging, the converter is rolled forward towards the converter aisle to expose the mouth (charge port). The primary hood is retracted and the tuyere air is cut. Following charging, the converter is rolled back with tuyere air on, and the primary hood drops down over the converter mouth.
>
> **Slag blowing:** Once the converter is charged with matte, the slag blow may begin. During the slag blow, air is injected into the molten metal bath in order to separate impurities from the copper. Sulfur combines with air to form SO_2, which is routed to the No.1 or No.2 acid plant. Silica is charged to the converter via sling conveyor during the slag blow. Once the slag blow is completed, impurities are decanted, or skimmed, from the top of the molten metal bath as converter slag into ladles for crane transport to the converter slag return launder at the cyclone smelting furnace.
>
> **Copper blowing:** Following the slag blow, the copper blow is initiated. Air is again injected into the molten metal bath to oxidize sulfur to SO_2, which is routed to the acid plant. The finished product of copper converting is blister copper, at 98 percent purity. The copper is poured from the converter into a ladle for crane transport to the anode furnace.

Three 60-ton capacity, 90 ft.-span, overhead cranes service the converters and furnace, as well as the anode casting facility.

Converter process (primary) gases pass through a jacketed hood, equipped with a thermosiphon boiler that produces steam, into a settling chamber, and through individual high velocity flues. The gases pass through a hot gas fan, a spray chamber, and a 16-unit plate-and-wire Cottrell precipitator (electrostatic precipitator), which recovers about eight tons of dust per day, at recoveries averaging 98 percent efficiency. The gas stream then enters the gas cleaning plant for the No.1 acid plant.

The El Paso Plant utilizes a computerized gas management system in order to monitor and control converter process gas variables, such as volumetric flow rates, temperatures, pressures and levels. Monitoring and controlling these variables allows maximum collection of converter process gases, which are routed to the No.1 acid plant. The computer optimizes the converter primary hood draft by monitoring the draft control dampers of the operating converters. For instance, the computer detects when a converter is being rolled in and compensates for the gas surge added to the system, thereby reducing pressurization of the system and increasing off-gas containment. In short, the draft control system is designed to clear the converter primary hoods with the least amount of draft on the system. This maximizes SO_2 gas grade and minimizes off-gas volume, thereby enhancing control efficiencies, i.e., it enhances both SO_2 and particulate capture.

Converter Secondary Hoods/Building Evacuation System

Process gases escaping the converter's primary hood are captured by the secondary hooding system. This diluted SO_2 gas stream is ducted to the converter building ventilation baghouse (CIN = CU/CONVIBH)* where particulates are removed prior to discharge through the annulus of the 828-foot copper stack (CU/STK/AN)*.

Fugitive emissions released inside the enclosed converter building are removed from the building at the roof monitor level through a ductwork header. The header converges into the 12-foot diameter inlet flue for the building ventilation baghouse, rated at about 600,000 actual cubic feet per minute (acfm). As noted above, this baghouse exhausts to the copper stack annulus.

Observations:

1) The team inspected the ConTop smelting cyclones and associated feed systems and ductwork, the holding furnace and associated ductwork, the converter furnaces and associated primary and secondary hood systems, and the converter building ventilation system. In addition, the remote (outside) matte pouring and reclaiming ventilation system was inspected.

2) In the computerized gas management system control room computers (Foxborough) were being kept powered and cooled with a fan system.

3) All major components and equipment associated with this process were intact and consistent with the plant process description.

Anode Operation

From the converters, blister copper is transferred to two 160 ton capacity tilting anode furnaces (Attachment B, Figure VI.A-11). Each anode furnace is gas or oil-fired. A Phelps Dodge gas reformer converts natural gas to carbon monoxide, which is injected through the tuyeres during the poling cycle to reduce copper oxide to copper.

Anodes, each weighing 750 pounds, are cast on a 22-mold casting wheel, which services both anode furnaces. Anodes (the copper circuit's ultimate product) are shipped to ASARCO's Amarillo Copper Refinery.

Off-gases are released into the converter building, which, as discussed above, is evacuated into the converter building ventilation baghouse and then to the annulus of the copper stack.

Observations:

1) The anode casting molds were not present.

2) All major components and equipment associated with this process, other than the anode casting molds, were intact and consistent with the air permit process description.

VENTILATION GAS STREAMS TO ACID PLANTS No.1 & No.2

ConTop Cyclone Reactor System **Gas Cleaning/No. 2 Acid Plant**

When the cyclone reactors are not operating, a holding fire is applied to the metal bath in the holding vessel. The off-gases, consisting of products of combustion from the holding fire, pass through the spray chamber and Cottrell Electrostatic Precipitator (ESP), as described above, in route to the 828-foot copper stack.

When the reactors are operating, the process gases from the holding furnace (after passage through the waste heat boiler) pass through a hot gas fan and then to a spray chamber and ESP before entering an intermediate fan and Venturi scrubber. The handling of spray chamber and ESP dust is described later in this document. Gases from the Venturi split to enter the bottom of a packed scrubber. The scrubber is a conventional packed tower with a counter-current flow of water for further cooling and particulate removal from the gas stream. Gases leave the scrubbers at 90° Fahrenheit (F) and are split again to enter the mist precipitators. The tube-type mist precipitators are completely lead lined and are designed to remove acid mist and particulates.

The gases then flow to a drying tower, which is a conventional packed tower in which 93 percent sulfuric acid passes counter-current to the gas stream. The drying tower acid removes any moisture from the gases. The dried gases next pass to mist eliminators, which remove acid droplets before the gas enters the compressors. Two 3,500-hp compressors move the gas through the acid plant. The gases are compressed here and enter the heat exchanger or pre-heater.

The pre-heater is a high efficiency heater, fired by natural gas or No.2 diesel fuel, and is on line continuously. Combustion products vent to the atmosphere (C-2)*. The pre-heater is used during startup or during periods of low SO_2 gas strength. Here the gases are heated to 780°F for entry into the first bed for conversion to sulfur trioxide (SO_3) (Attachment B, Figure VI.A-4). The converter is a three-pass system with double absorption, i.e., the converter contains three layers of vanadium pentoxide catalyst.

In the interpass absorption tower, another conventional packed tower that uses countercurrent scrubbing, 98 percent sulfuric acid is used to absorb SO_3 from the gas stream. The SO_3 unites with the water in the acid, which strengthens the acid concentration. The gas next enters mist eliminators for acid droplet removal from the stream.

Gas exiting the interpass absorption tower is reheated in a heat exchanger and passed through the third pass of the converter, where any traces of SO_2 in the gas are converted to SO_3. The gas then advances to the final absorption tower, a conventional packed tower providing counter-current flow of 98 percent sulfuric acid, to absorb any remaining SO_3. The gas, with reduced SO_2, passes through mist eliminators and out the acid plant stack (AP2/S)*.

The strengthened acid from the absorption towers is diluted to the desired concentration of acid, either 98 percent or 93 percent, which increases the volume of acid present in the system, and the product acid is pumped to the acid storage facility. A decolorizing facility at the acid plant treats black acid with hydrogen peroxide to clarify it.

The acid storage facilities, serving both acid plants (Attachment B, Figure VI.A-18), consist of four 5,000 ton capacity tanks and four 6,000 ton capacity tanks (T-l through T-8)*. There are seven loading stations to accommodate railroad cars or trucks (PF-l)*. Acid is predominantly shipped by rail, with occasional shipments made by truck.

Water for the Venturi scrubbers in the gas cleaning system is provided from the water that circulates over the packed towers. To control the build-up of solids, blowdown water from two Venturi scrubbers returns continuously to a stripper tank to remove dissolved SO_2 and then to a surge tank at the acid plant water treatment plant. In addition to blowdown from two Venturi scrubbers, the surge tank collects washdown water from the mist precipitators and blowdown water from the No.1 acid plant. Blowdown water is processed in the water treatment plant.

Observations:

1) Cooling towers remain operational with water flowing and sprinkler system active to prevent a fire hazard and the buildup of salts on the pads.

2) Sulfuric acid has been removed from both acid plants, as well as all storage tanks and associated piping as a preventative measure to reduce risk of leaks or spills.

3) Packing material from the acid absorption towers has been removed, cleaned, and stored in the zig-zag building, in order to prevent the need for repeated cleaning. Conduit elbow was removed and not replaced to allow for the removal of the packing material. Vanadium pentoxide catalyst remains in the converter.

4) All major components and equipment (towers, pumps, heat exchangers, heaters, Venturi scrubbers, etc.) associated with this process were intact and consistent with the plant process description.

<u>**Converter Gas Cleaning/No. 1 Acid Plant**</u>

The No.1 acid plant treats the primary off-gases from converter operations. Gas cleaning begins with a Venturi scrubber that removes particulate matter from the gases and reduces the gas temperature to 105°F (Attachment B, Figure VI.A-16). The Venturi has three pumps, rated at 1,000 gallons per minute (gpm) each, two of which are used continuously with the third kept as a spare.

Gases leaving the Venturi are split before entering the two packed scrubbers, which are packed towers with counter-current flow of gas and dilute acid. Here gases are cooled to 75° F and heat is removed from the diluted solution by plate coolers. This system has three pumps rated at 700 gpm each, two of which are continuously used.

Gases next enter the four mist precipitators, two in parallel, at 75°F. Moisture as well as remaining particulate matter is removed. At this point, some of the gases may be bypassed to the

No.2 acid plant to enrich the gas stream there. All the blowdown from these three systems (Venturi, packed towers, mist precipitators) is fed to the new water treatment plant.

After the mist precipitators, the cool (75° F), dry gases become one stream again before entering the 93 percent sulfuric acid (H_2SO_4) drying tower, which provides a counter-current flow of 98 percent sulfuric acid against the gas stream. The drying tower removes any remaining moisture in the gases. After exiting the circulation system, the gases pass through a mist pad to remove acid droplets ahead of the two acid blowers. The acid blowers, rated at 2250 horsepower each, convey the gases through the remainder of the acid plant (Attachment B, Figure VI.A-3).

Gases leaving the compressors must be re-heated by either heat exchangers or the pre-heater. The pre-heater, which is natural gas fired, is on line at all times. Combustion products vent to the atmosphere. Once the gases attain 750°F, they enter the first vanadium pentoxide catalyst bed for conversion of SO_2 to SO_3. Heat exchangers before and after the catalyst beds capture heat released in the conversion process. Gases leave the first bed and are cooled by a quench air system off the main compressor and No.1 heat exchanger. The second bed conversion occurs and gases are cooled for entry into the Venturi scrubber.

In the Venturi absorber (intermediate absorbing tower), 85 percent of the SO_3 is converted to H_2SO_4. Gases enter the absorber at the top with a concurrent flow of 98 percent sulfuric acid that is sprayed into the throat of the Venturi through a leumet spray pipe. Gases proceed down the Venturi and through a second Venturi throat with another spray of 98 percent sulfuric acid. Gases enter the bottom of the entrainment separator, a conventional packed tower, where particulates are removed before gases re-enter the heat exchangers. Gases are reheated to the conversion temperature of the third and fourth beds and return to the final absorption tower for further absorption.

The final absorber is a conventional packed tower with a counter-current flow of 98 percent sulfuric acid. At this point, the remaining 15 percent SO_3 is converted to H_2SO_4. Gases exit the circulation area, and demist pads remove acid droplets from the tail gas before venting to the atmosphere through the acid plant stack (AP1/S)*.

In summary, the converter process gas handling system directs/handles high strength gases flowing to the primary hood boilers, the settling chamber, the waste heat boiler, the converter hot gas fan, the spray chamber, the ESP, the intermediate fan, and to the Venturi scrubber. The gases next enter the gas cleaning system before entering the No.1 acid plant. The exhaust from this plant is discharged to the atmosphere through the tail gas stack (APl/S)*.

Observations:

1) Cooling towers remain operational with water flowing and sprinkler system active to prevent a fire hazard and the buildup of salts on the pads.

2) Sulfuric acid has been removed from both acid plants, as well as all storage tanks and associated piping as a preventative measure to reduce risk of leaks or spills.

3) Packing material from the acid absorption towers has been removed, cleaned, and stored in the zig-zag building, in order to prevent the need for repeated cleaning.

4) All major components and equipment (towers, pumps, heat exchangers, heaters, Venturi scrubbers, etc.) associated with this process were intact and consistent with the plant process description. Condition of the packed towers is indeterminate due to uncertainties regarding the extent of internal corrosion.

Spray Chamber and ESP Dust Handling System

When in operation, furnace spray chambers (Attachment B, Figure VIA-17) are cleaned using front end loaders (HF-32 and HF-36)* and haul trucks (HF-33 and HF-37)*. Dust is minimized through complete enclosure of the chamber entrances. The enclosures are vented to the converter building baghouse, which discharges through the copper stack annulus (CU/STK/AN)*.

Dust is recovered from two Cottrell ESPs, the ConTop furnace Cottrell ESP, and the converter Cottrell ESP. ConTop ESP dust is pneumatically conveyed to a surge bin, which discharges to the fluid bed dryer through a total enclosure under negative pressure. The storage bin discharge exhaust from pneumatic conveying is routed to the converter building ventilation baghouse, which discharges to the copper stack annulus (CU/STK/AN)*.

Converter ESP dust is screw-conveyed and transported on an enclosed conveyance to the presently enclosed and ventilated pugmill, where water is added to the dust via sprays. The conditioned dust will continue to be further conveyed on enclosed belts to an enclosed discharge chute, which empties inside a totally enclosed and ventilated rail car loading building. The baghouse ventilating the pugmill and rail car loading building vents to the converter building ventilation baghouse, which discharges to atmosphere through the copper stack annulus.

Observations:

1) The team inspected the upper portion of the ConTop furnace Cottrell housing the AC/DC rectifiers and power supply system. Approximately one-half of the rectifier wiring was not present or not connected.

2) The team observed the COMS from the catwalk on the converter building baghouse.

3) All associated ductwork from the converter building, pugmill baghouse, dry feed bins and the acid plants, etc. was present and intact.

4) All major components and equipment associated with this process, except as noted above, were intact and consistent with the plant process description.

IV. ANCILLARY EQUIPMENT

Oxygen Plant

The oxygen plant (BOC Cryoplants rated at 450 tons of oxygen per day) supplies oxygen to the two ConTop cyclone reactors, the holding furnace's oxy-fuel burners, and the converters. Cyclone oxygen level will average 70 percent, and converter oxygen concentration will be 24 percent (on slag blow only).

Because the oxygen plant is an air separation unit utilizing compression, purification, cooling, low temperature distillation, and re-warming steps, releases to atmosphere are gaseous components of air, principally nitrogen (N_2). This plant is not fuel fired and therefore no air contaminants are emitted to the atmosphere.

Observations:

1) Oxygen plant lines and tanks have been filled with nitrogen and the plant has been sealed to maintain tank system integrity.

2) All major components and equipment associated with this process were intact and consistent with the plant process description.

<u>**Resources Conservation Company (RCC) Water Treatment Plant**</u>

When in operation, the RCC Water Treatment Plant (Attachment B, Figure VI.A-20) processes blow-down water from the ConTop and converter Venturi scrubbers, the packed towers, and mist precipitators. The vapor recompression system design results in zero water discharge.

Lime is delivered by truck to the water treatment plant several times a week. Lime is pneumatically conveyed to the lime silo, which is controlled by a baghouse (DC-4)*.

Thickener solids are collected on a drum filter. The filter cake at 30 - 50 percent moisture is front-end loaded into a haul truck for transfer to the bedding building.

The blowdown water from the treatment plant is processed in a spray dryer. In the spray dryer system, the process air is heated by a direct, natural gas fired air heater to the desired operating temperature. The heated process air enters the cylindrical vertical drying chamber through a series of vanes which are concentric with the spray machine. The spray machine is mounted on the chamber center at the top and disperses the feed material into the process air stream. The discharge of feed from the spray machine is opposite to the swirling air stream to insure intimate mixing of the hot air and the finely atomized feed material. Drying is virtually instantaneous at this point, with the residual moisture being removed as the particles travel downward through the drying chamber. The dried product and process air leave the chamber through the outlet elbow and are conveyed to the bag filter product collector (baghouse). The filtered air then discharges through the exhaust fan (S-1)*, and the product is collected at the bottom of the bag filter housing. Solids are returned by enclosed tote box using fork lifts or haul trucks to the unloading building.

A direct-fired boiler fired by natural gas at the plant discharges combustion emissions to atmosphere (C-5)*.

There are two 750,000 gallon wastewater holding tanks, the 100,000 gallon surge tank, and the clarate tank (T-26, T-27, T-28, T-29)*.

Observations:

All major components and equipment associated with this process were intact and consistent with the plant process descriptions.

V. MISCELLANEOUS SUPPORT EQUIPMENT

The following is a list of miscellaneous equipment identified in the process description:

- Plant service-haul trucks
- Street sweepers
- Front-end loaders
- Water truck
- Fork lifts
- Acid plant fork lifts
- First marine boiler
- Second marine boiler
- No.2 fuel oil storage tank (emergency use)
- Diesel storage tank for vehicle fueling
- Gasoline storage tank

Observation: These items, in addition to other mobile equipment, were reported as being onsite based on an inventory list provided by ASARCO, and their presence was verified by the team during the investigation.

VI. CARE AND MAINTENANCE ACTIVITIES DURING SHUT DOWN

Observations:

- Gear boxes and bearings on pertinent equipment (motors) have been packed with a special preservative oil to protect against corrosion.
- Oxygen plant lines and tanks have been filled with nitrogen and the plant has been sealed to maintain tank system integrity.
- Cooling towers remain operational with water flowing and sprinkler system active to prevent a fire hazard and the buildup of salts on the pads.
- The gas management system computers are kept powered and cooled with a fan system.
- The Continuous Emissions Monitoring System (CEMS) and Continuous Opacity Monitoring System (COMS) boxes have been either removed and stored or sealed for protection against the elements.
- Generator and turbine components in the power plant sensitive to oxidation have been covered with a heavy fabric coated in "cosmolene" preservative to prevent corrosion.
- Sulfuric acid has been removed from all tanks and associated piping.
- Packing material from the acid absorption towers has been removed, cleaned, and stored in the zig-zag building.
- In-plant roads are currently being continually watered to minimize dust emissions during the on site remediation activities.
- A staff of 17 full-time employees were working onsite at the time of this investigation (including staff assigned to both maintenance and remediation activities). Shortly after the shut down in 1999, a crew of 15 maintained the operation but was reduced to four or five after approximately two years.

On April 24, 2006, ASARCO personnel submitted a document describing startup procedures titled El Paso Copper Smelter Startup Plan, dated November 11, 1998, and revised April 20, 2006. This document is included in Attachment D of this report.

VII. GENERAL OBSERVATIONS & CONCLUSION

Observation by the team during the investigation support the conclusion that general maintenance and basic housekeeping throughout the plant was adequate to prevent significant soiling and/or deterioration of equipment; however, there are areas of the plant where cleaning, repair, and/or replacement of parts (electrical, electronic, switches, meters, hoses, air lines, etc.) will be needed to operate. In addition, there are some areas of dust accumulation, missing or frayed wiring, minor corrosion and/or oxidation of metal panels, and missing or dislodged covers on duct insulation. Regional staff, having observed and investigated the plant while in operation, noted that the copper circuit and related equipment appeared to be basically unchanged (with the exceptions noted in this report) from pre-shutdown conditions.

Conclusion: Based on observations made and documentation reviewed, the team concluded that all major processes and abatement equipment/components, including associated operational controls and infrastructure required by the air permit, were present, intact, and in generally satisfactory condition. Individual components/equipment will need to be assessed to determine the extent of any internal damage that may exist due to possible effects of corrosion. If the plant were to start up, ASARCO has addressed the issue - identifying components needing repair or replacement prior to start up – in its start up plan. Any maintenance, start up, and shut down events may be subject to the general rules in 30 TAC chapter 101, subchapter F.

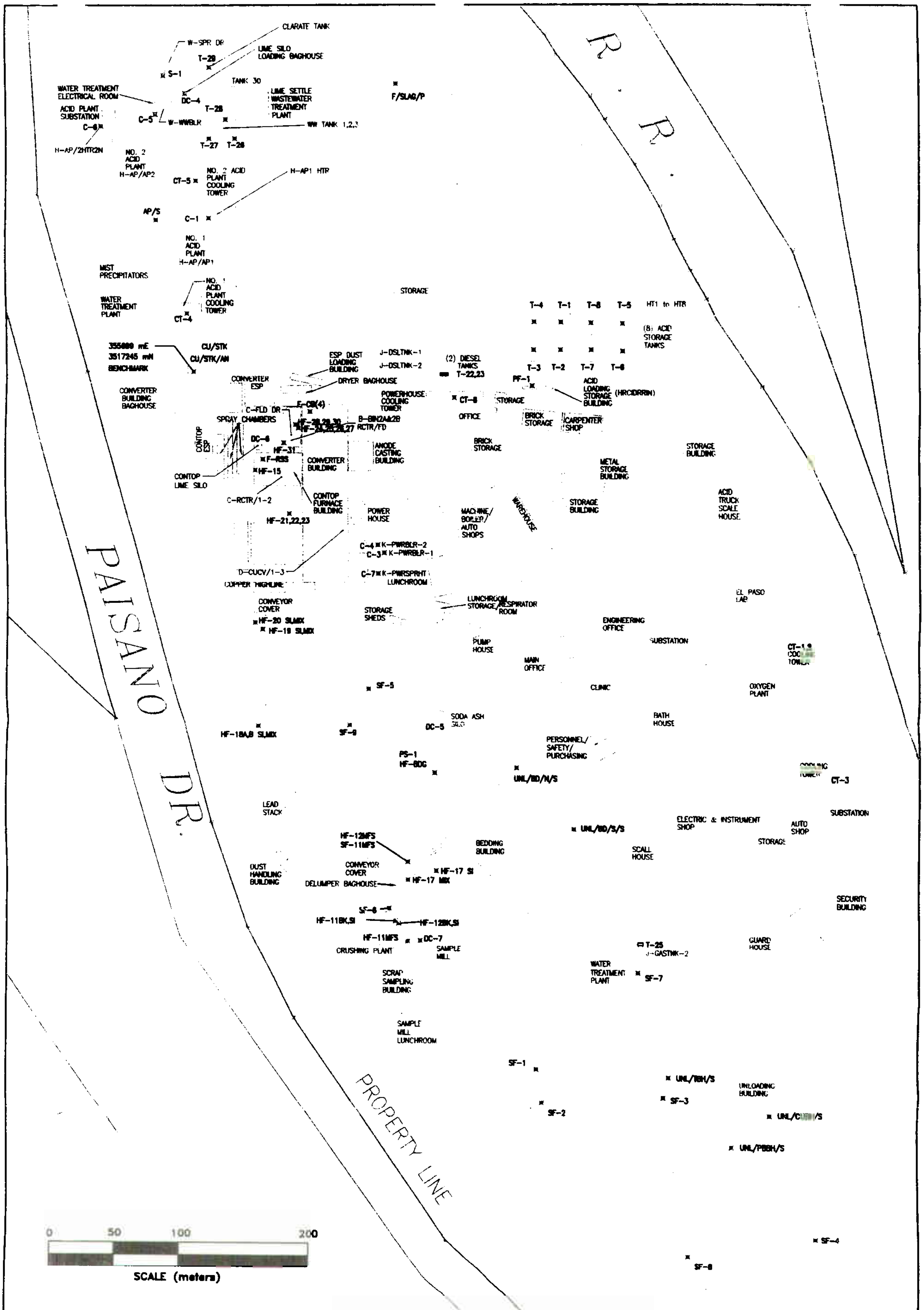
Phase I Regional Investigation Report

AMERICAN SMELTING AND REFINING COMPANY (ASARCO)

ATTACHMENTS

A. Site Map
B. ASARCO Process Description Figures
C. Photographs
D. ASARCO <u>El Paso Copper Smelter Startup Plan</u> (hard copy only)

Attachment A



ASARCO, LLC – El Paso Plant

Plot Plan

Figure 4-1

Sheet Title:	PLOT PLAN ENLARGED
Designed By:	RVC
Checked By:	D. Cabe
Date:	Sept. 06, 2006
Sheet:	1 of 1
File:	05318 plotplan.dwg

zephyr® environmental corporation

Attachment B

Attachment B.

ASARCO Process Description Figures

FIGURE VI.A-1
EL PASO PLANT - EXISTING COPPER CIRCUIT
FEED MATERIAL FLOW

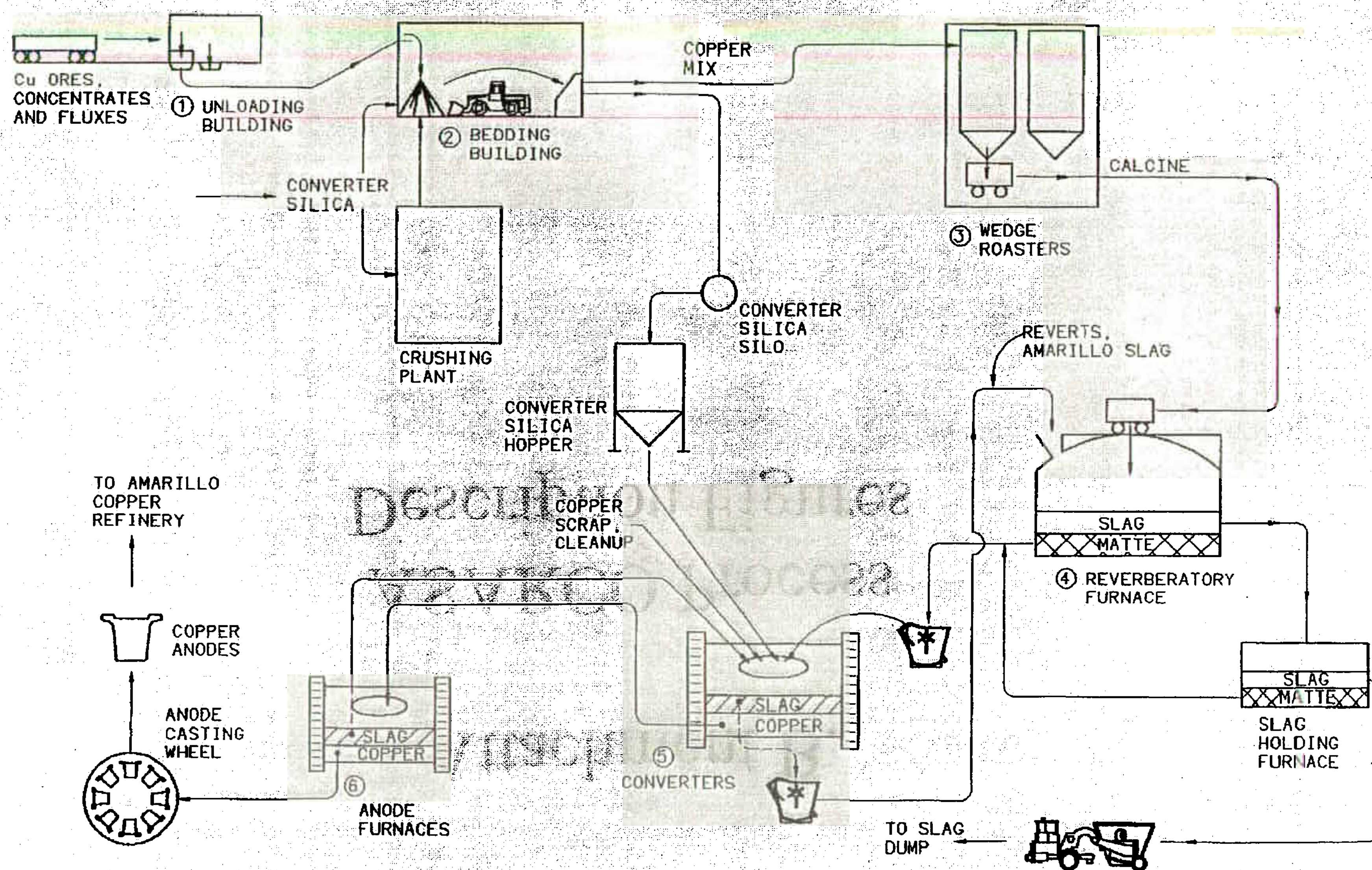
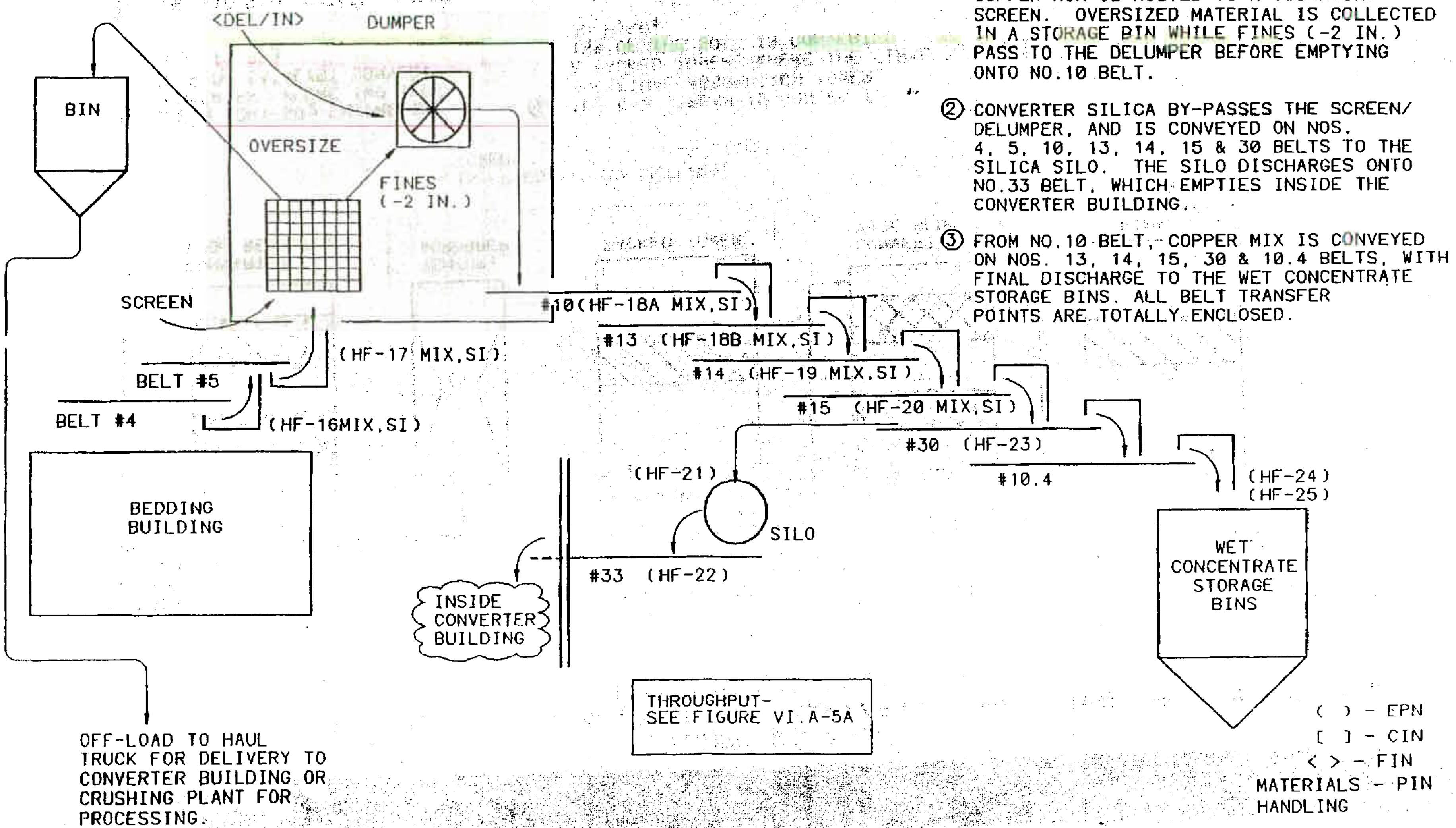


FIGURE VI.A-2

EL PASO PLANT - CONTOP MODIFICATION

MATERIALS HANDLING

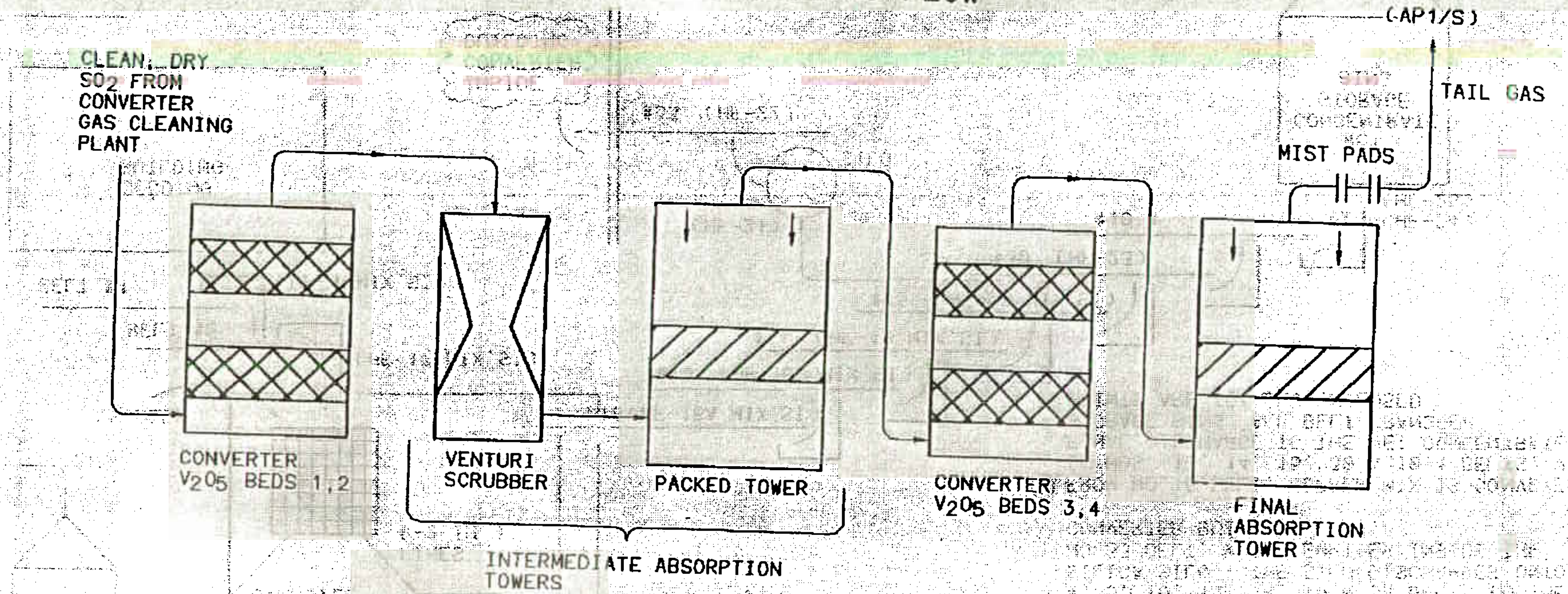


1. FOLLOWING NO.4 TO NO.5 BELT TRANSFER, COPPER MIX IS ROUTED TO A VIBRATING SCREEN. OVERSIZED MATERIAL IS COLLECTED IN A STORAGE BIN WHILE FINES (-2 IN.) PASS TO THE DELUMPER BEFORE EMPTYING ONTO NO.10 BELT.

2. CONVERTER SILICA BY-PASSES THE SCREEN/DELUMPER, AND IS CONVEYED ON NOS. 4, 5, 10, 13, 14, 15 & 30 BELTS TO THE SILICA SILO. THE SILO DISCHARGES ONTO NO.33 BELT, WHICH EMPTIES INSIDE THE CONVERTER BUILDING.

3. FROM NO.10 BELT, COPPER MIX IS CONVEYED ON NOS. 13, 14, 15, 30 & 10.4 BELTS, WITH FINAL DISCHARGE TO THE WET CONCENTRATE STORAGE BINS. ALL BELT TRANSFER POINTS ARE TOTALLY ENCLOSED.

FIGURE VI.A-3
EL PASO PLANT - NO 1 ACID PLANT, <AP/AP1> - EXISTING AND CONTOP CASES
PROCESS GAS FLOW



① CLEAN, DRY SO_2 ENTERS THE CONVERTER, WHERE TWO BEDS OF V_2O_5 CATALYST CONVERT SO_2 TO SO_3.

② THE GAS STREAM THEN ENTERS THE INTERMEDIATE ABSORPTION TOWERS, CONSISTING OF A VENTURI SCRUBBER AND A PACKED TOWER, WHERE 85% OF THE SO_3 IS CONVERTED TO H_2SO_4.

③ A SECOND PASS TO THE CONVERTER CONVERTS THE REMAINDER OF SO_2 TO SO_3 IN V_2O_5 BEDS 3 AND 4.

④ THE GAS STREAM IS ROUTED TO THE FINAL ABSORPTION TOWER, A PACKED TOWER, WHERE THE FINAL 15% OF THE SO_3 IS CONVERTED TO H_2SO_4.

⑤ DUAL MIST PADS REMOVE ACID DROPLETS FROM THE TAIL GAS PRIOR TO DISCHARGE FROM THE ACID PLANT STACK.

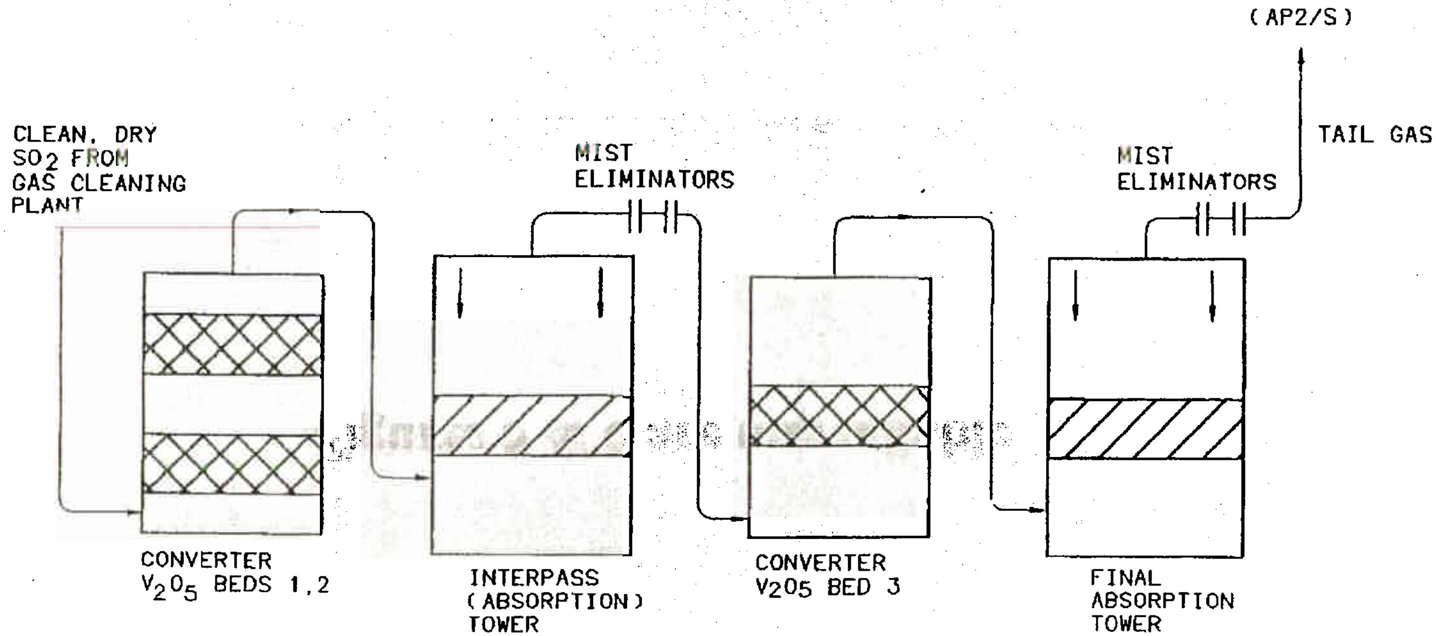
NOTE: NO. 1 ACID PLANT RATED AT 500 TPD.

( ) - EPN

< > - FIN

NO. 1 ACID - PIN PLANT

FIGURE VI.A-4
EL PASO PLANT - NO.2 ACID PLANT, <AP/AP2> - EXISTING AND CONTOP CASES PROCESS GAS FLOW



① CLEAN, DRY SO_2 ENTERS THE CONVERTER, WHERE TWO BEDS OF V_2O_5 CATALYST CONVERT SO_2 TO SO_3.

② GASES THEN ENTER THE INTERPASS OR INTERMEDIATE ABSORPTION TOWER, A PACKED TOWER, WHERE SO_3 IS CONVERTED TO H_2SO_4.

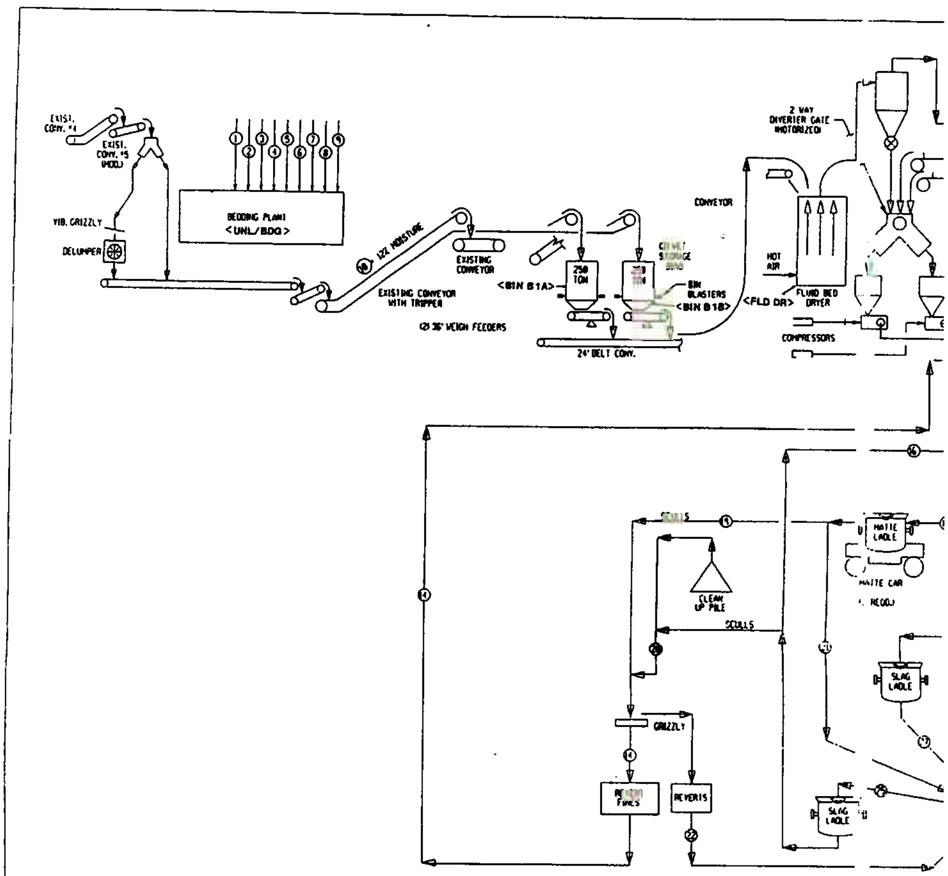
③ A SECOND PASS TO THE CONVERTER CONVERTS THE BALANCE OF SO_2 TO SO_3 IN V_2O_5 BED 3.

④ THE GAS STREAM IS NEXT ROUTED TO THE FINAL ABSORPTION TOWER , A PACKED TOWER, WHERE THE REMAINING SO_3 IS CONVERTED TO H_2SO_4.

⑤ MIST ELIMINATORS PREVENT ACID DROPLET CARRY-OVER TO THE CONVERTER FROM THE INTERPASS TOWER. IN ADDITION, MIST ELIMINATORS REMOVE ACID DROPLETS FROM THE TAILGAS PRIOR TO DISCHARGE FROM THE ACID PLANT STACK.

NOTE: NO.2 ACID PLANT RATED AT 800 TPD.

( ) - EPN
< > - FIN
NO.2 ACID PLANT - PIN



JACOBS ENGINEERING GROUP INC.

DWG. NO.	TITLE
	DRAWING REFERENCE LIST
FS-2	PROCESS FLOW GAS SHEET
FS-3	NONCONTACT FLOW SCHEMATIC
FS-4	CONTACT WATER FLOW SCHEMATIC

NO.	BY	DATE	DESCRIPTION

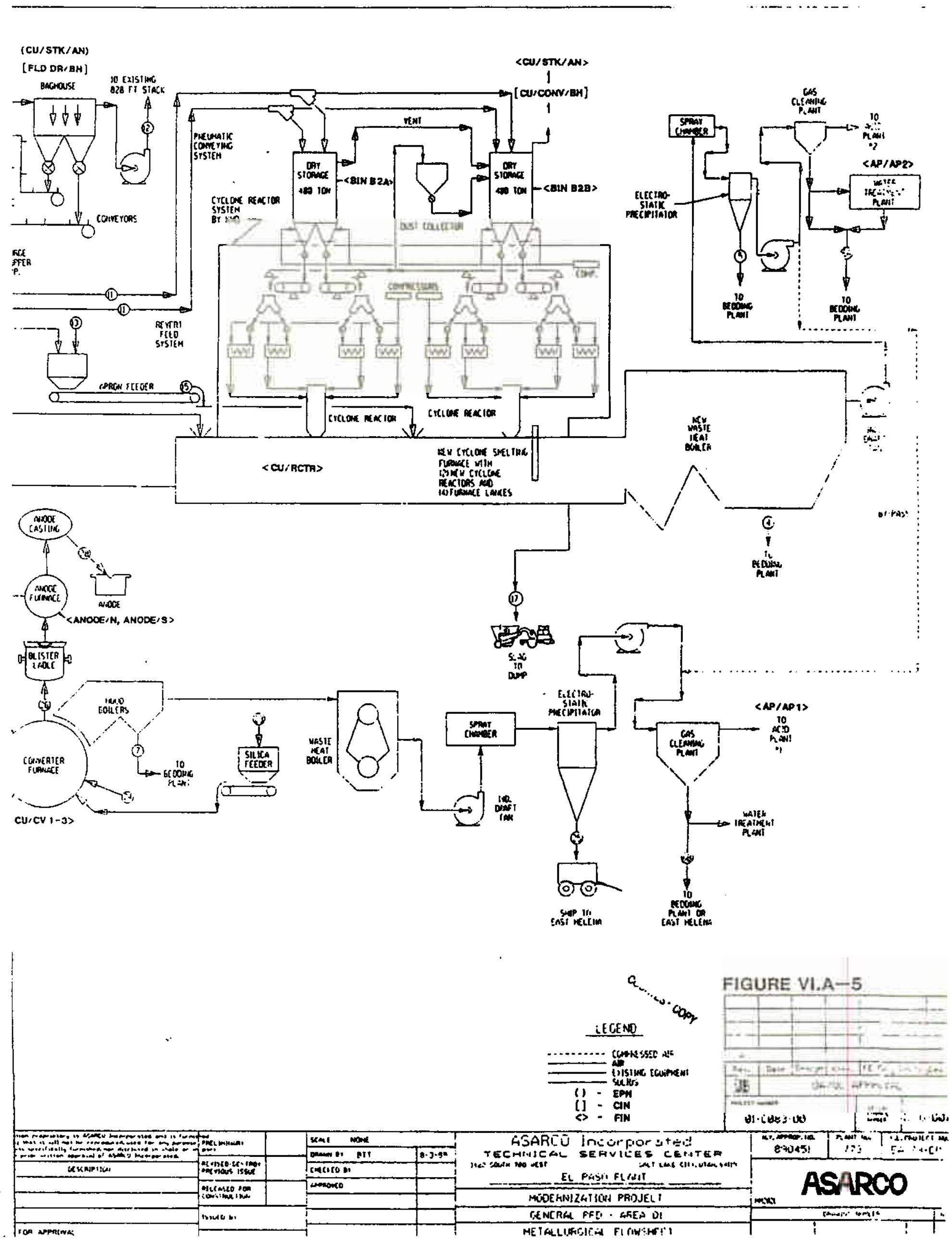
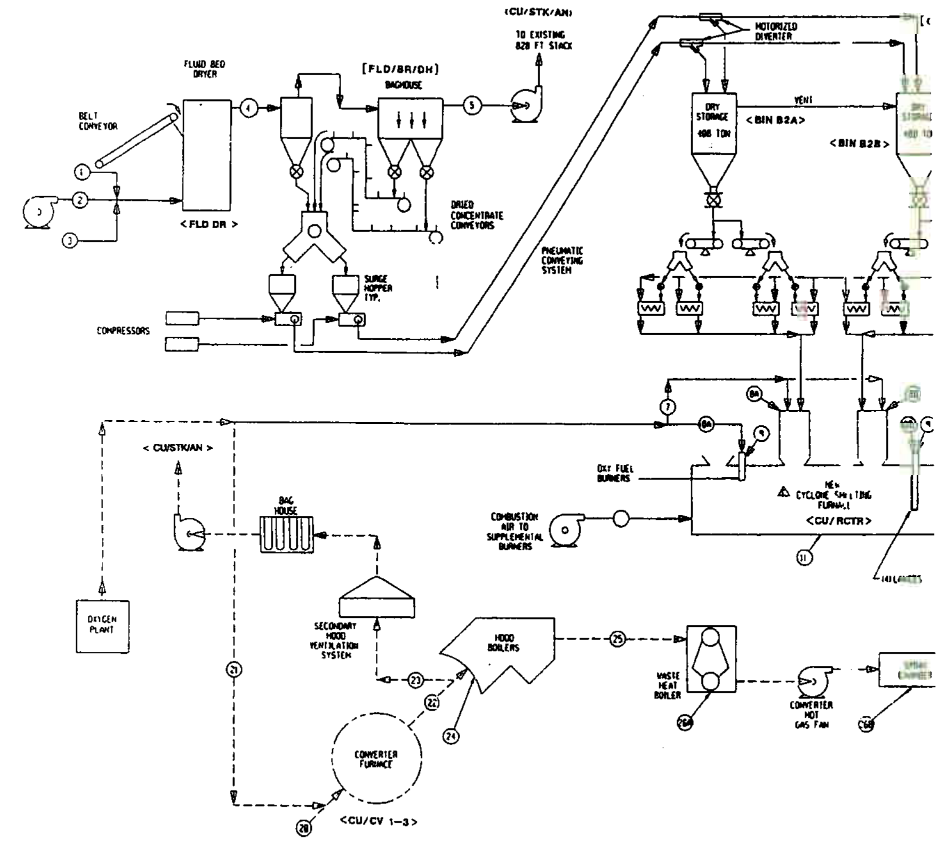

<CU/STK/AN>
[FLD DR/BH]
BAGHOUSE
TO EXISTING 828 FT STACK
CONVEYORS
PNEUMATIC CONVEYING SYSTEM
CYCLONE REACTOR SYSTEM
REVERT FEED SYSTEM
APRON FEEDER
<CU/STK/AN>
[CU/CONV/BH]
VENT
DRY STORAGE 480 TON
<BIN B2A>
<BIN B2B>
DUST COLLECTOR
COMPRESSORS
CYCLONE REACTOR
<CU/RCTR>
NEW CYCLONE SMELTING FURNACE WITH (2) NEW CYCLONE REACTORS AND (4) FURNACE LANCES
NEW WASTE HEAT BOILER
SPRAY CHAMBER
GAS CLEANING PLANT
<AP/AP2>
WATER TREATMENT PLANT
ELECTRO-STATIC PRECIPITATOR
TO BEDDING PLANT
BY-PASS
ANODE CASTING
ANODE
ANODE FURNACE
<ANODE/N, ANODE/S>
BLISTER LADLE
HOOD BOILERS
CONVERTER FURNACE
CU/CV 1-3>
SILICA FEEDER
WASTE HEAT BOILER
SLAG TO DUMP
SPRAY CHAMBER
IND. DRAFT FAN
ELECTRO-STATIC PRECIPITATOR
<AP/AP1>
TO ACID PLANT #1
GAS CLEANING PLANT
WATER TREATMENT PLANT
SHIP TO EAST HELENA
TO BEDDING PLANT OR EAST HELENA
LEGEND
COMPRESSED AIR
AIR
EXISTING EQUIPMENT
SOLIDS
() - EPN
[] - CIN
<> - FIN
ASARCO Incorporated
TECHNICAL SERVICES CENTER
EL PASO PLANT
MODERNIZATION PROJECT
GENERAL PFD - AREA 01
METALLURGICAL FLOWSHEET
SCALE NONE
890451
ASARCO

FIGURE VI.A-5



JACOBS ENGINEERING GROUP INC.

REFERENCES

DWG. NO.	TITLE
	DRAWING REFERENCE LIST
FS-1	METALLURGICAL FLOWSHEET
FS-3	NON CONTACT WATER FLOW SCHEMATIC
FS-4	CONTACT WATER FLOW SCHEMATIC

NO.	BY	DATE	DESCRIPTION
△			
△			
△			
△			
△			

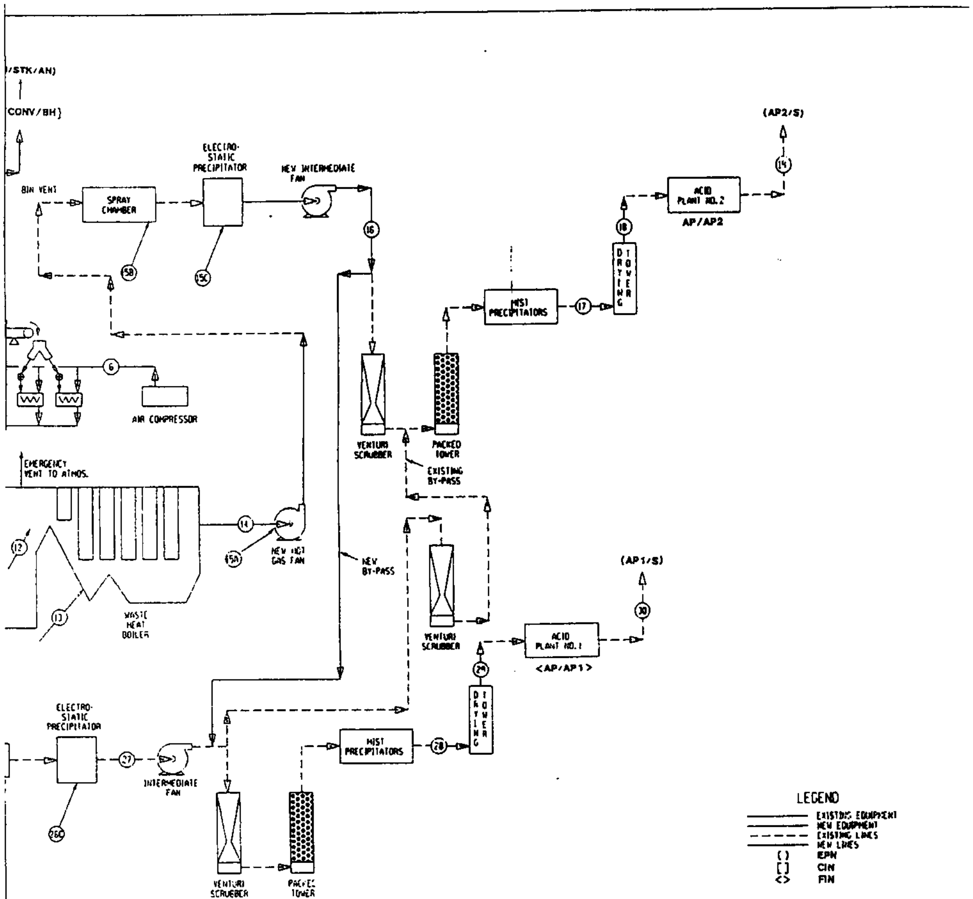


FIGURE VI.A—6

COURTESY COPY

Rev.	Date	Design	Chkr.	TE PA	Dept.	Gen.

QA/QC APPROVAL

DESCRIPTION		
	PRELIMINARY	
	REVISED-DESTROY PREVIOUS ISSUE	
	RELEASED FOR CONSTRUCTION	
	ISSUED BY	
FOR APPROVAL		
FOR PRELIMINARY ESTIMATE	DATE	

SCALE NONE

DATE PRINTED

ASARCO Incorporated
TECHNICAL SERVICES CENTER

EL PASO PLANT

MODERNIZATION PROJECT
GENERAL PFD - AREA 12
PROCESS GAS FLOWSHEET

PLANT NO. 773

E.A-79-EP

ASARCO

REPLACED: 10/17/90

FIGURE VI.A-7
EL PASO PLANT - COPPER CIRCUIT UNDER CONTOP
FEED MATERIAL FLOW

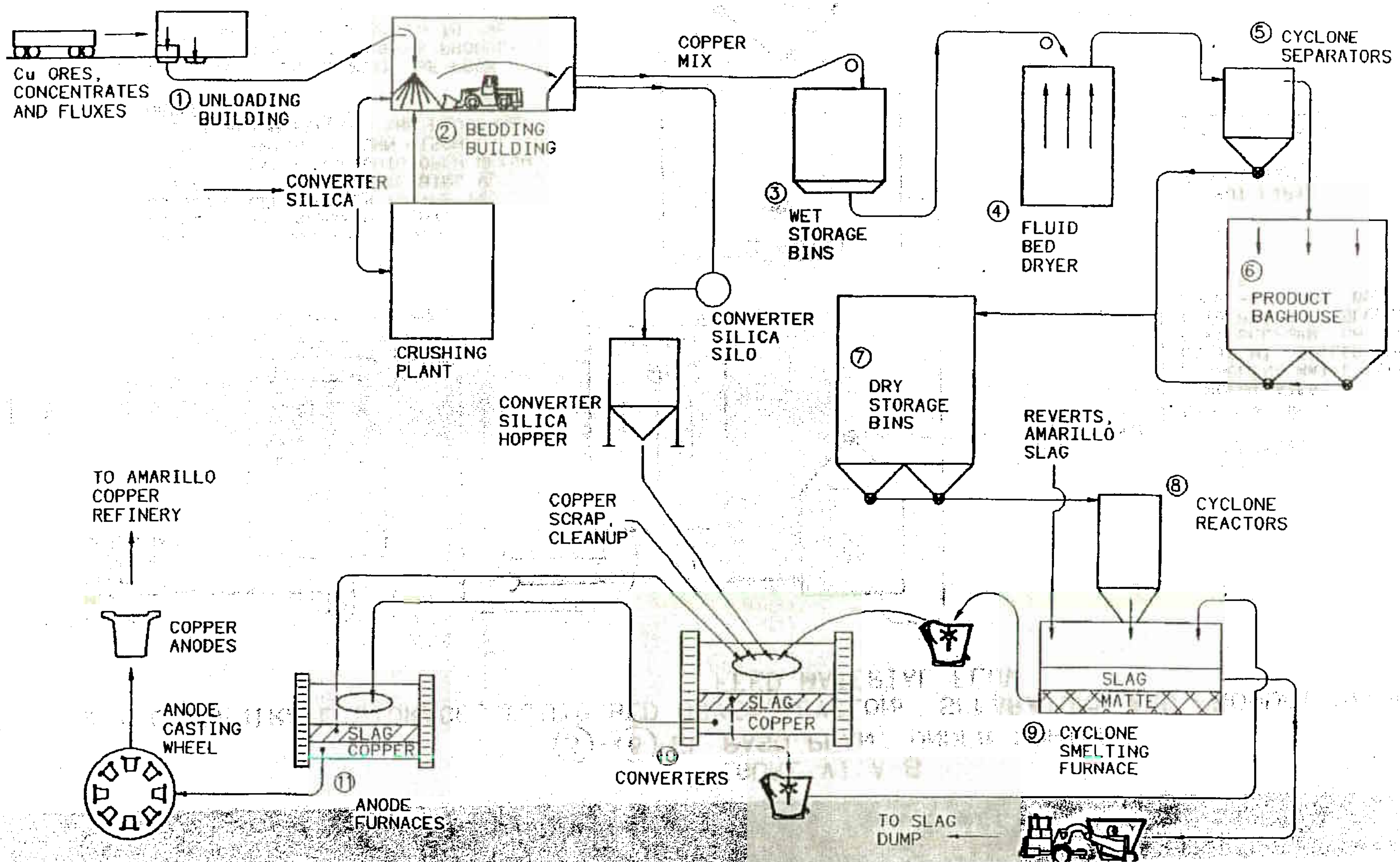
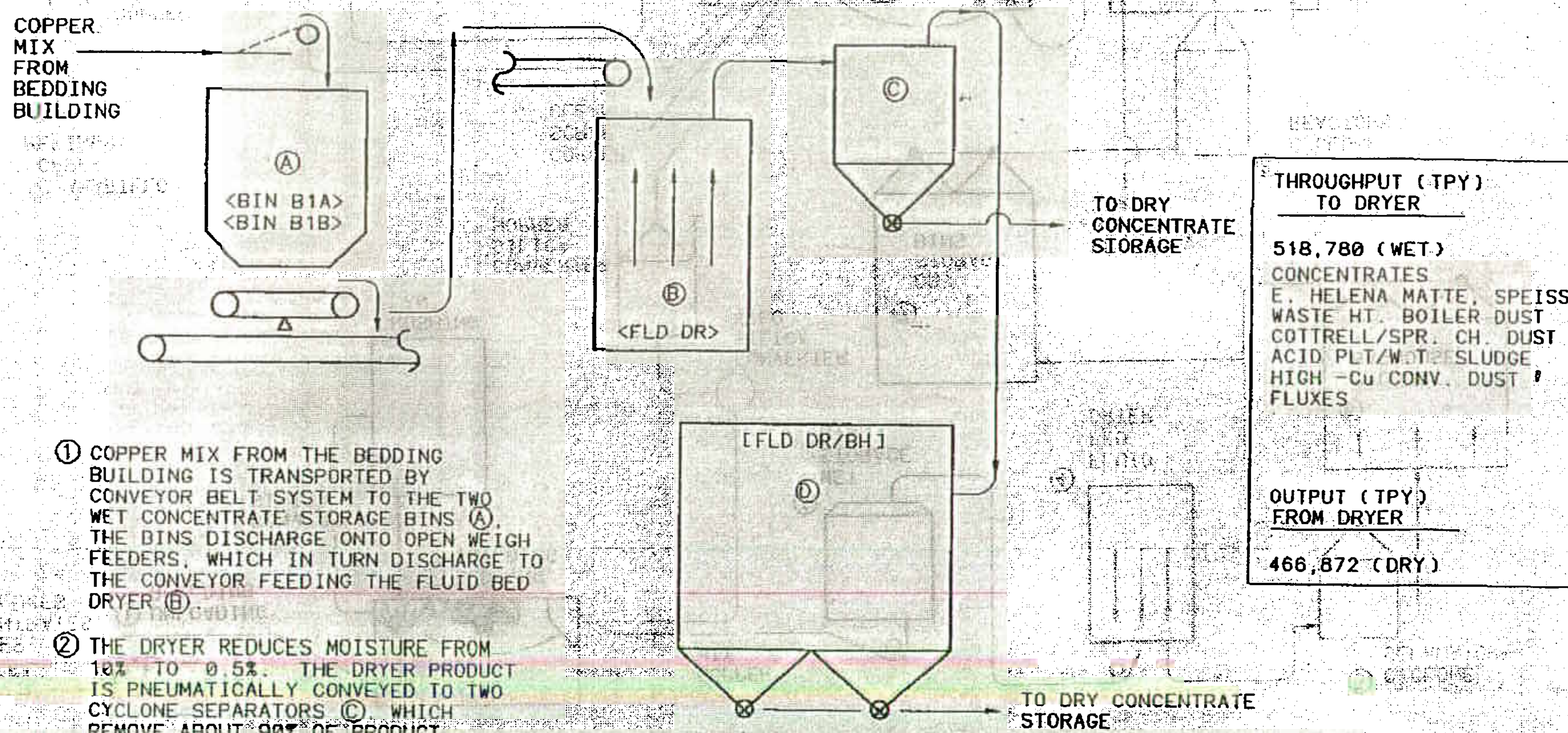


FIGURE VI.A-8

3–6 EL PASO PLANT UNDER CONTOP

WET CONCENTRATE STORAGE, FLUID BED DRYER, CYCLONE SEPARATORS AND PRODUCT BAGHOUSE FEED MATERIAL FLOW

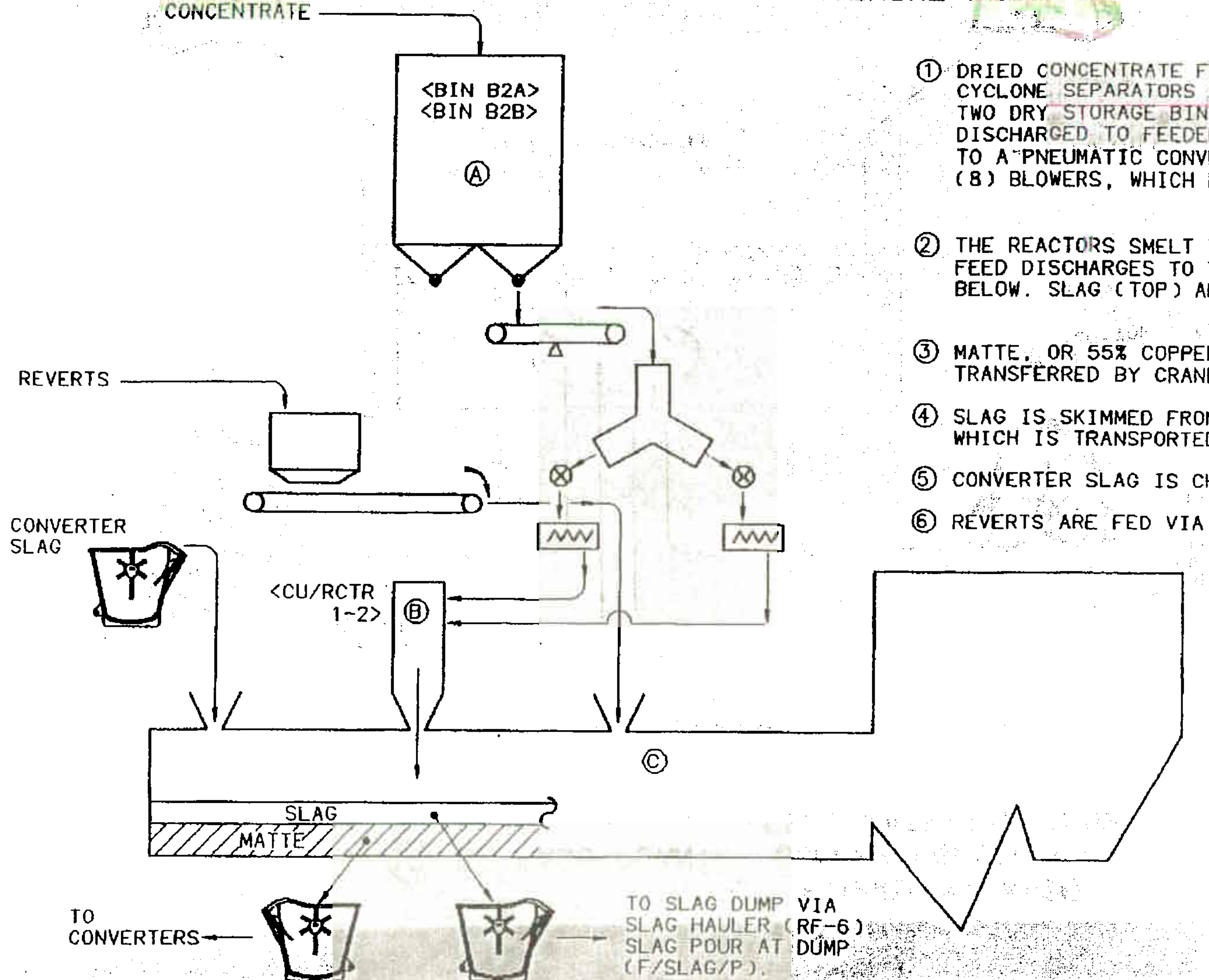


1. COPPER MIX FROM THE BEDDING BUILDING IS TRANSPORTED BY CONVEYOR BELT SYSTEM TO THE TWO WET CONCENTRATE STORAGE BINS A. THE BINS DISCHARGE ONTO OPEN WEIGH FEEDERS, WHICH IN TURN DISCHARGE TO THE CONVEYOR FEEDING THE FLUID BED DRYER B.
2. THE DRYER REDUCES MOISTURE FROM 10% TO 0.5%. THE DRYER PRODUCT IS PNEUMATICALLY CONVEYED TO TWO CYCLONE SEPARATORS C, WHICH REMOVE ABOUT 90% OF PRODUCT FROM THE STREAM.
3. DRYER PRODUCT NOT RECOVERED IN C IS RECOVERED IN PRODUCT BAGHOUSE D.
4. DRY CONCENTRATE COLLECTED IN C AND D IS PNEUMATICALLY CONVEYED TO DRY CONCENTRATE STORAGE.

FIGURE VI.A-9

7 – 9 EL PASO PLANT UNDER CONTOP

DRY STORAGE BINS/REACTOR FEED SYSTEM, CYCLONE REACTORS AND SMELTING FURNACE FEED MATERIAL FLOW



1. DRIED CONCENTRATE FROM THE PRODUCT BAGHOUSE AND CYCLONE SEPARATORS IS PNEUMATICALLY CONVEYED TO TWO DRY STORAGE BINS (A). THE FEED IS BOTTOM DISCHARGED TO FEEDER BELTS. THE FEED IS SPLIT TO A PNEUMATIC CONVEYING SYSTEM CONSISTING OF (8) BLOWERS, WHICH FEED THE TWO CYCLONE REACTORS (B).

2. THE REACTORS SMELT THE FEED MATERIAL. MOLTEN FEED DISCHARGES TO THE CYCLONE SMELTING FCE. (C) BELOW. SLAG (TOP) AND MATTE (BOTTOM) LAYERS FORM.

3. MATTE, OR 55% COPPER, IS TAPPED INTO LADLES AND TRANSFERRED BY CRANE TO THE CONVERTERS.

4. SLAG IS SKIMMED FROM THE FURNACE INTO A SLAG POT, WHICH IS TRANSPORTED TO THE SLAG DUMP.

5. CONVERTER SLAG IS CHARGED BY LADLE TO THE FURNACE.

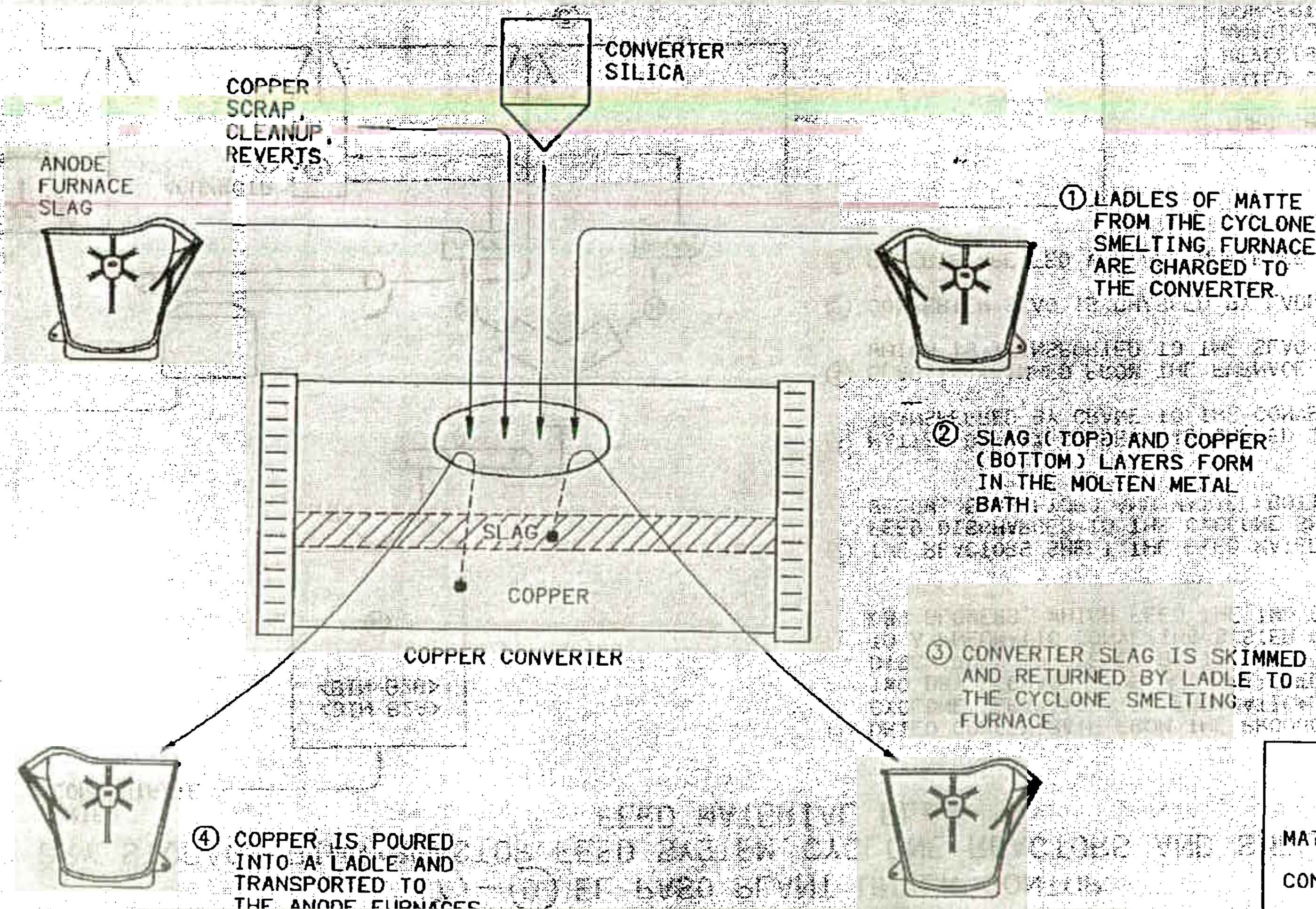
6. REVERTS ARE FED VIA APRON FEEDER TO THE FURNACE.

THROUGHPUT (TPY)	
DRIED CONCENTRATE	466,872
REVERTS	15,286
AMARILLO SLAG	5,897
CONVERTER SLAG	

OUTPUT (TPY)	
SLAG	255,224
MATTE	205,636
W.H. BOILER DUST	2,690

FIGURE VI.A-10

10 EL PASO PLANT - COPPER CONVERTERS - CONTOP CASE
FEED MATERIAL FLOW



THROUGHPUT (TPY)	
MATTE	205,636
CONVERTER SILICA	20,250
SCRAP	24,000
REVERTS CLEANUP	13,363

FIGURE VI.A-11

(11) EL PASO PLANT - ANODE FURNACES - CONTOP CASE
FEED MATERIAL FLOW

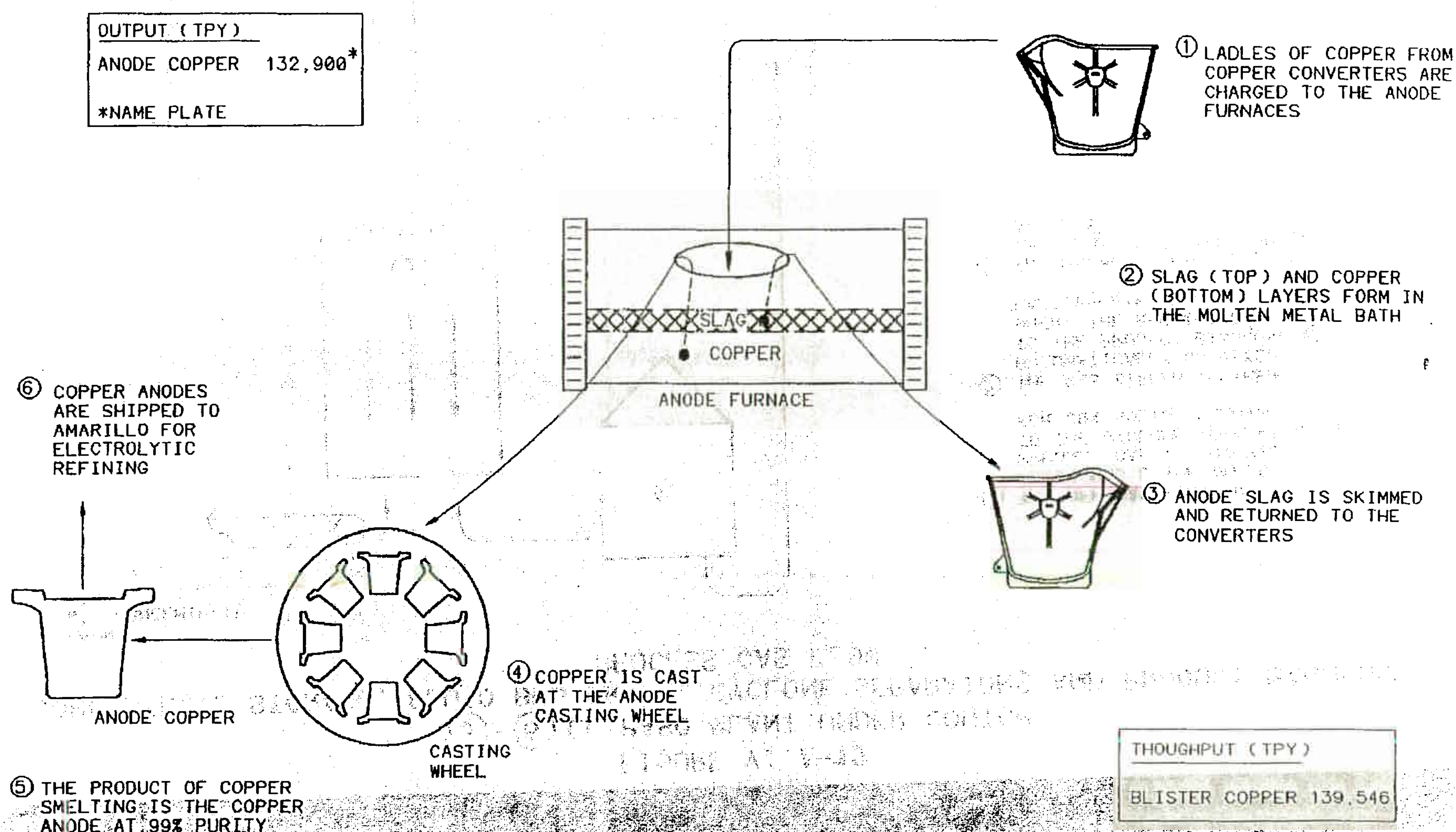
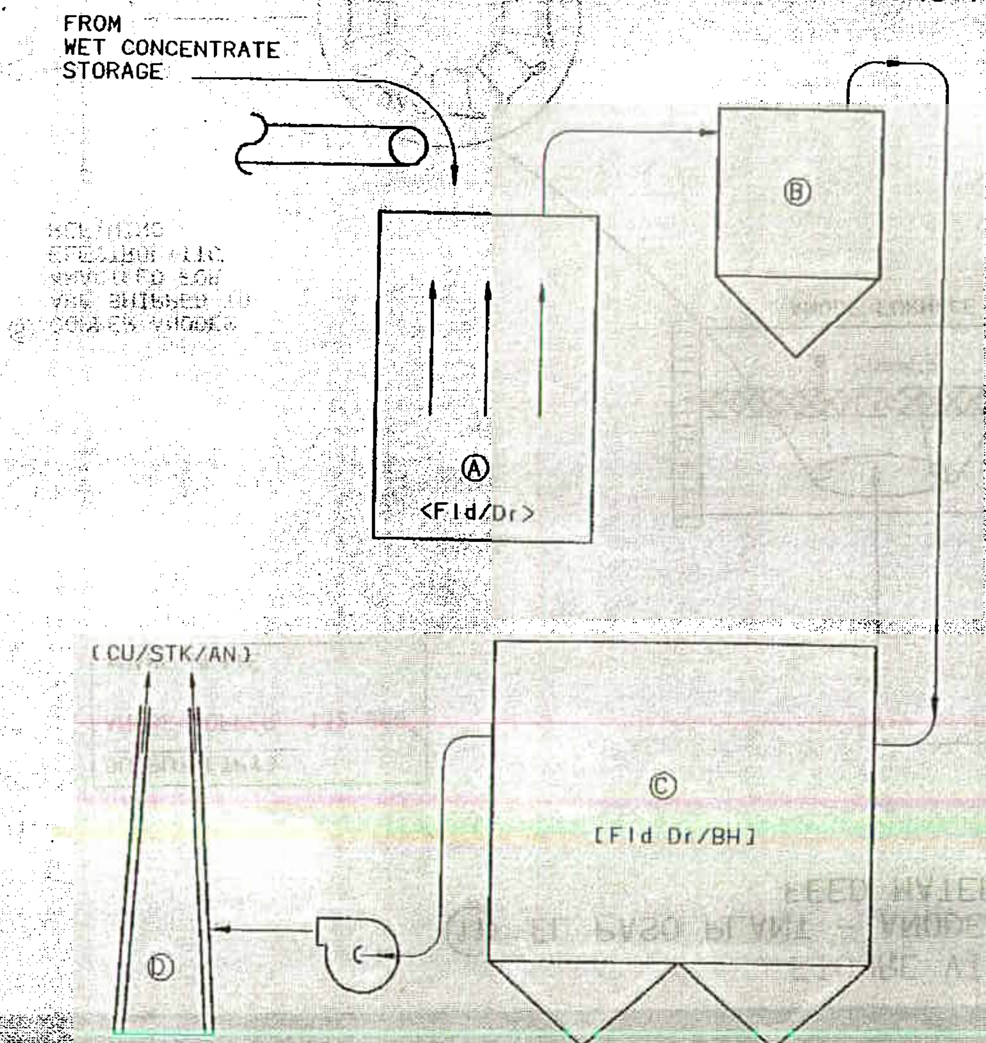


FIGURE VI.A-12

(3)-(6) EL PASO PLANT UNDER CONTOP
WET CONCENTRATE STORAGE, FLUID BED DRYER, CYCLONE SEPARATORS AND PRODUCT BAGHOUSE
PROCESS GAS FLOW



① THE OFF-GAS FROM THE FLUID BED DRYER Ⓐ IS PNEUMATICALLY CONVEYED TO THE CYCLONE SEPARATORS Ⓑ FOR 90% SOLIDS REMOVAL.

② THE GAS STREAM IS THEN PNEUMATICALLY CONVEYED TO THE PRODUCT BAGHOUSE Ⓒ, WHERE THE REMAINING PARTICULATE IS COLLECTED.

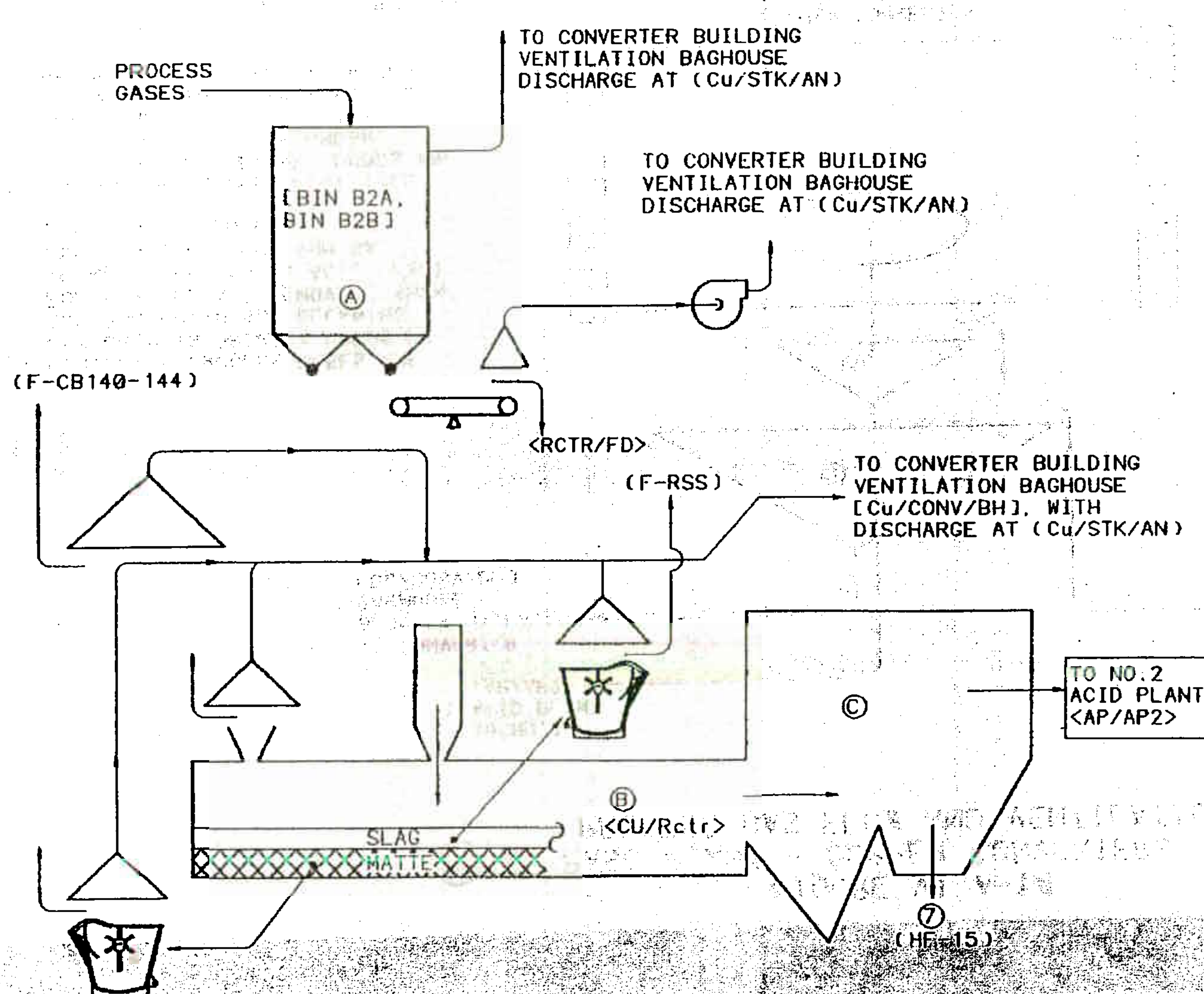
③ THE BAGHOUSE EXHAUSTS TO THE ANNULUS OF THE COPPER STACK Ⓓ.

( ) - EPN
[ ] - CIN
< > - FIN
COPPER - PIN
SMELTING

FIGURE VI.A-13

⑦-⑨ EL PASO PLANT UNDER CONTOP

DRY STORAGE BINS/REACTOR FEED SYSTEM, CYCLONE REACTORS AND SMELTING FURNACE PROCESS AND VENTILATION GAS FLOW



① PROCESS GASES ENTERING THE DRY STORAGE BINS Ⓐ ARE VENTED TO THE CONVERTER BUILDING VENTILATION BAGHOUSE, WHICH EXHAUSTS THROUGH THE COPPER STACK ANNULUS.

② THE CONVERTER BUILDING VENTILATION BAGHOUSE VENTS THE FEEDER BELT DISCHARGES.

③ MATTE TAPPING, SLAG SKIMMING AND CONVERTER SLAG RETURNS TO THE SMELTING FURNACE Ⓑ ARE HOODED AND VENT TO THE CONVERTER BUILDING VENTILATION BAGHOUSE AND COPPER STACK ANNULUS.

④ PROCESS GASES FROM Ⓑ PASS THROUGH WASTE HEAT BOILERS Ⓒ AND ARE ROUTED TO GAS CLEANING FOR PARTICULATE REMOVAL, THEN TO NO. 2 ACID PLANT (SEE COTTRELL ESP AND GAS CLEANING FLOWSHEETS).

⑤ FURNACE PROCESS FUGITIVES RELEASED INSIDE THE CONVERTER BUILDING ARE ROUTED TO THE CONVERTER BUILDING BAGHOUSE. BUILDING LEAKAGE VENTS TO ATMOSPHERE.

⑥ SLAG SKIM HOOD LEAKAGE IS TO ATMOSPHERE.

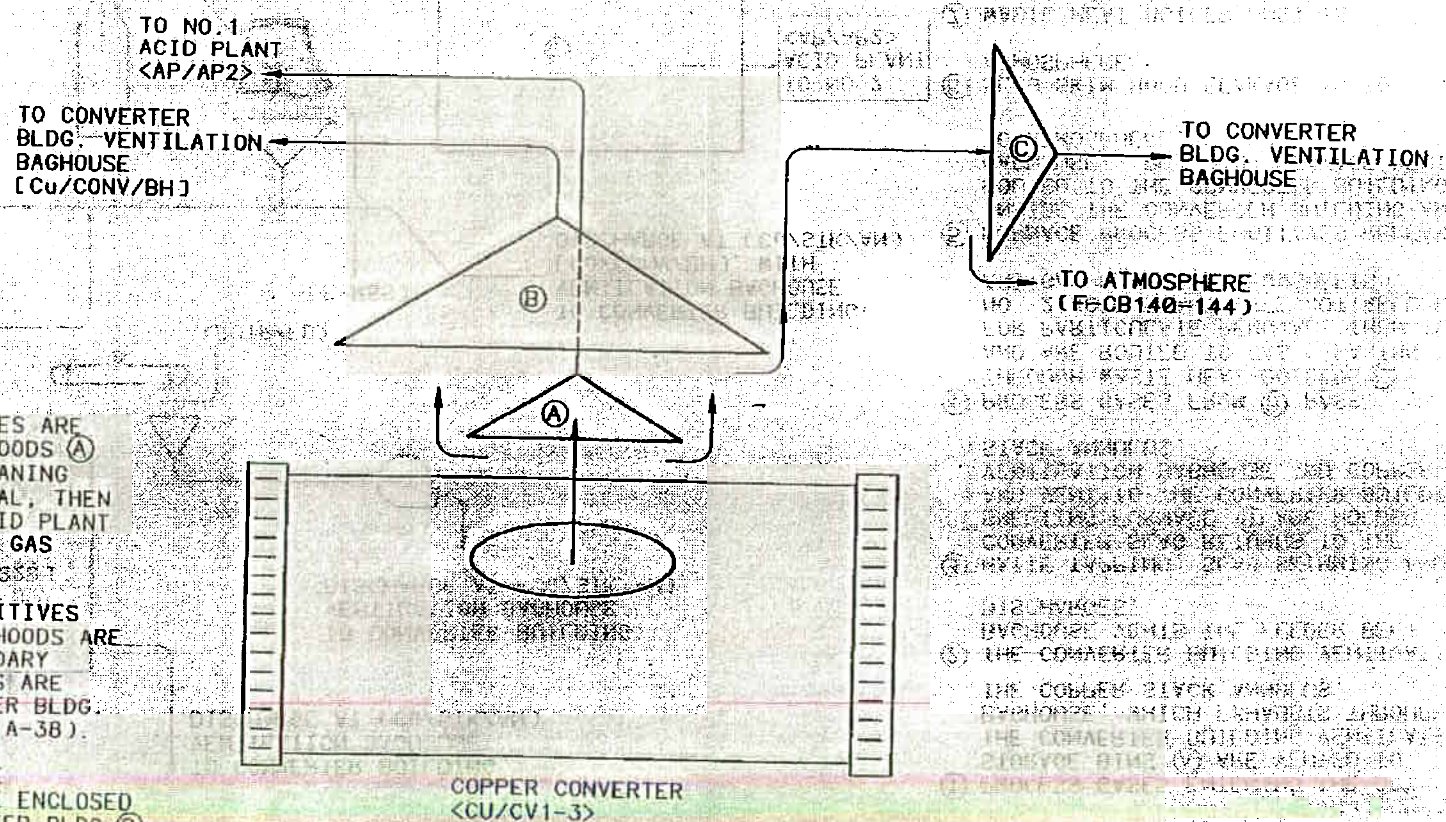
⑦ WASTE HEAT BOILER DUST IS COLLECTED IN CLOSED CONTAINERS AND TRANSPORTED TO THE UNLOADING BLDG.

( ) - EPN
[ ] - CIN
< > - FIN

MATERIALS - PIN
HANDLING,
COPPER SMELTING

FIGURE VI A-14

(10) EL PASO PLANT - COPPER CONVERTERS - CONTOP CASE PROCESS GAS FLOW AND VENTILATION SYSTEM



1. CONVERTER PROCESS GASES ARE CAPTURED IN PRIMARY HOODS (A) AND ROUTED TO GAS CLEANING FOR PARTICULATE REMOVAL, THEN TO NO. 1 (OR NO.2) ACID PLANT (SEE COTTRELL ESP AND GAS CLEANING FLOWHEETS).

2. CONVERTER PROCESS FUGITIVES ESCAPING THE PRIMARY HOODS ARE CAPTURED BY THE SECONDARY HOODS (B). THESE GASES ARE ROUTED TO THE CONVERTER BLDG. BAGHOUSE (SEE FIG. VI A-38).

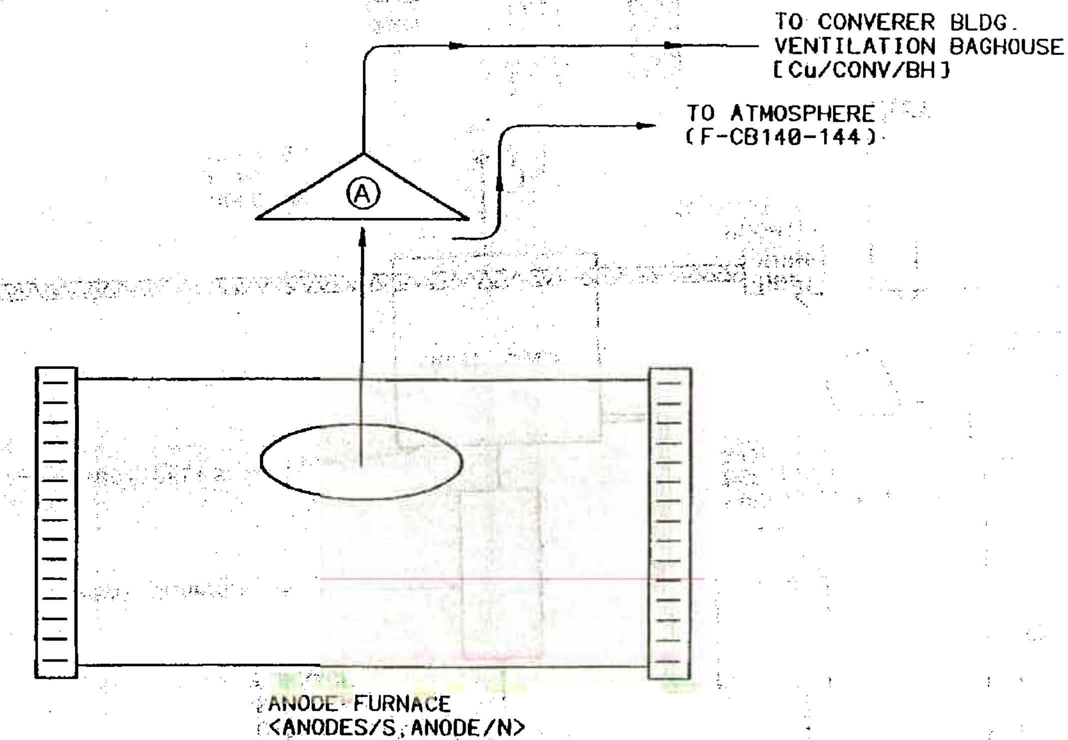
3. SECONDARY HOOD LEAKAGE IS RELEASED INSIDE THE ENCLOSED AND VENTILATED CONVERTER BLDG (C). THESE GASES ARE DUCTED TO THE CONVERTER BLDG. VENTILATION BAGHOUSE.

4. CONVERTER BLDG. PROCESS FUGITIVES WHICH ESCAPE CAPTURE BY THE ENCLOSED AND VENTILATED BLDG ARE RELEASED TO ATMOSPHERE

( ) - EPN
[ ] - CIN
<> - FIN

FIGURE VI.A-15

(11) EL PASO PLANT - ANODE FURNACES - CONTOP CASE
PROCESS GAS FLOW AND VENTILATION SYSTEM



(1) ANODE FURNACE PROCESS GASES ARE RELEASED INSIDE THE ENCLOSED AND VENTILATED CONVERTER BLDG. (A) THESE GASES ARE DUCTED TO THE CONVERTER BLDG. VENTILATION BAGHOUSE (SEE FIG. VI.A-3B).

(2) PROCESS GASES NOT CAPTURED BY THE ENCLOSED AND VENTILATED BLDG. ARE RELEASED TO ATMOSPHERE THROUGH OPENINGS.

( ) - EPN
[ ] - CIN
< > - FIN

COPPER - PIN
SMELTING

FIGURE VI.A-16
EL PASO PLANT - CONTOP CASE
SPRAY CHAMBERS, COTTRELL ESPs AND GAS CLEANING PLANT PROCESS AND VENTILATION GAS FLOW

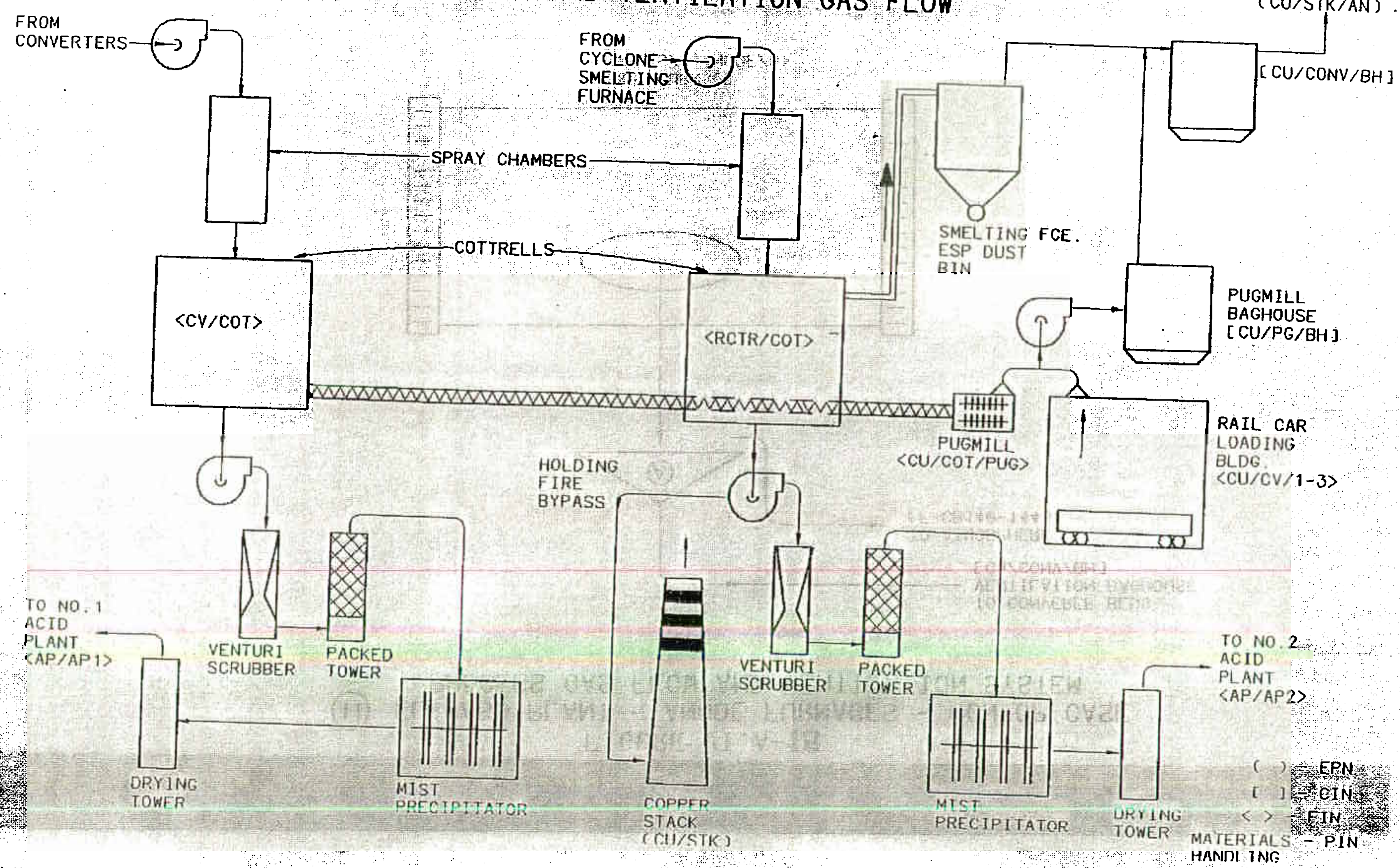
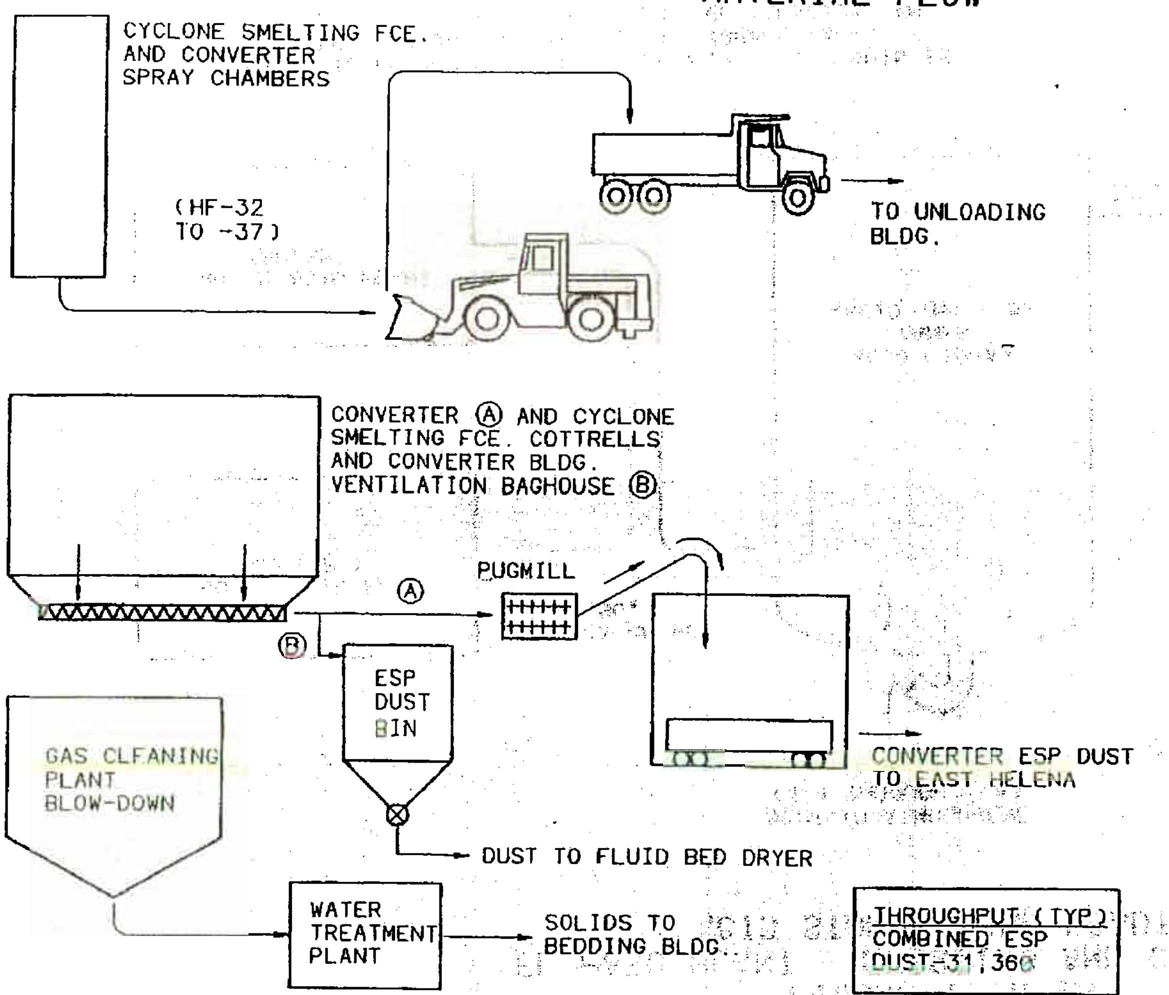


FIGURE VI.A-17
EL PASO PLANT
SPRAY CHAMBERS, COTTRELL ESPs AND GAS CLEANING PLANT - CONTOP CASE
MATERIAL FLOW



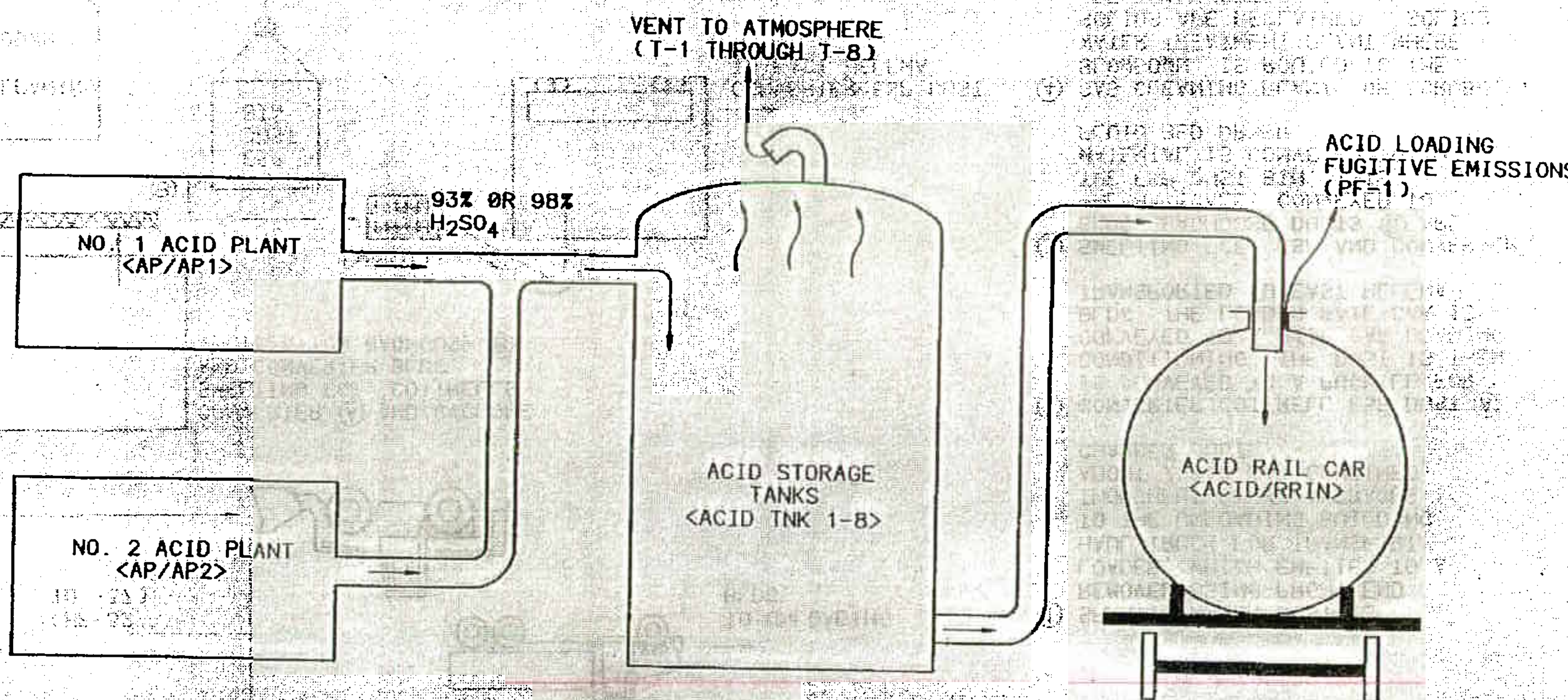
① SPRAY CHAMBER DUST IS REMOVED USING FRONT END LOADER, WHICH EMPTIES TO A HAUL TRUCK FOR TRANSPORT TO THE UNLOADING BUILDING. THOUGHPUT (TPY) AVERAGES ABOUT 7,840 FOR COMBINED CHAMBER DUSTS.

② CONVERTER COTTRELL ESP DUST Ⓐ IS CONVEYED TO A PUGMILL FOR CONDITIONING. THE DUST IS THEN CONVEYED TO A RAIL CAR LOADING BLDG. THE LOADED RAIL CAR IS TRANSPORTED TO EAST HELENA

③ SMELTING FCE. ESP AND CONVERTER BLDG. BAGHOUSE DUSTS Ⓑ ARE PNEUMATICALLY CONVEYED TO THE ESP DUST BIN. THIS MATERIAL IS CONVEYED TO THE FLUID BED DRYER.

④ GAS CLEANING PLANT, OR SCRUBBER BLOWDOWN, IS ROUTED TO THE WATER TREATMENT PLANT WHERE SOLIDS ARE RECLAIMED. SOLIDS ARE TRANSPORTED TO THE BEDDING BLDG.

FIGURE VI.A-18
EL PASO PLANT - EXISTING AND CONTOP CASES
ACID STORAGE AND LOADING



① ACID PRODUCED AT NO.1 AND NO.2 ACID PLANTS IS PIPED TO ONE OF EIGHT ACID STORAGE TANKS. FOUR TANKS HAVE 5,000T STORAGE CAPACITY, AND THE REMAINING FOUR HAVE 6,000T CAPACITY.

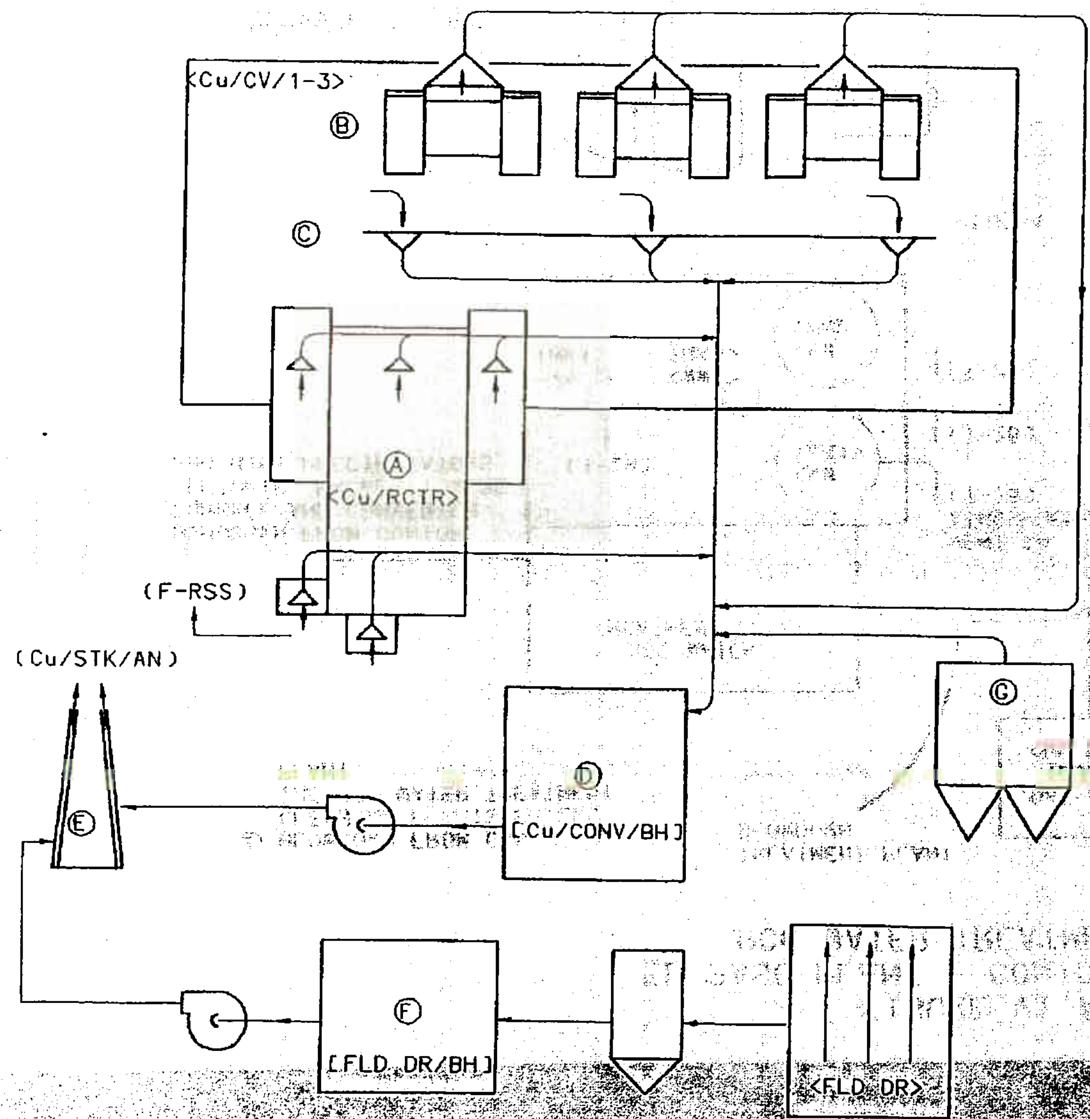
② ACID IS PUMPED TO RAIL TANK CARS AT THE ACID LOADING STATIONS.

THROUGHPUT (TYP)

EXISTING	CONTOP
167,835 @93% H_2SO_4	345,978 @93% H_2SO_4

( ) - EPN
< > - FIN
ACID - PIN
HANDLING

FIGURE VI.A-19
EL PASO PLANT - CONTOP CASE
CONVERTER BUILDING VENTILATION - TOP VIEW



1. TWO MATTE TAPPING TUNNELS ON EITHER SIDE OF THE CYCLONE REACTOR SMELTING FURNACE (A). THE CONVERTER SLAG RETURN LAUNDER AND THE TWO SLAG SKIMMING BAYS ARE DUCTED TO THE CONVERTER BUILDING VENTILATION BAGHOUSE (D).

2. THE THREE CONVERTERS (B) HAVE SECONDARY HOODS WHICH ROUTE FUGITIVES TO (D).

3. THE ENCLOSED CONVERTER BLDG. IS VENTED THROUGH THE EXHAUST DUCT (C) AT ROOF TOP MONITOR LEVEL. THESE DUCTS ARE ROUTED TO (D).

4. THE VENTILATION BAGHOUSE, AT APPROX. 600,000 ACFM, VENTS TO THE ANNULUS OF THE COPPER STACK (E).

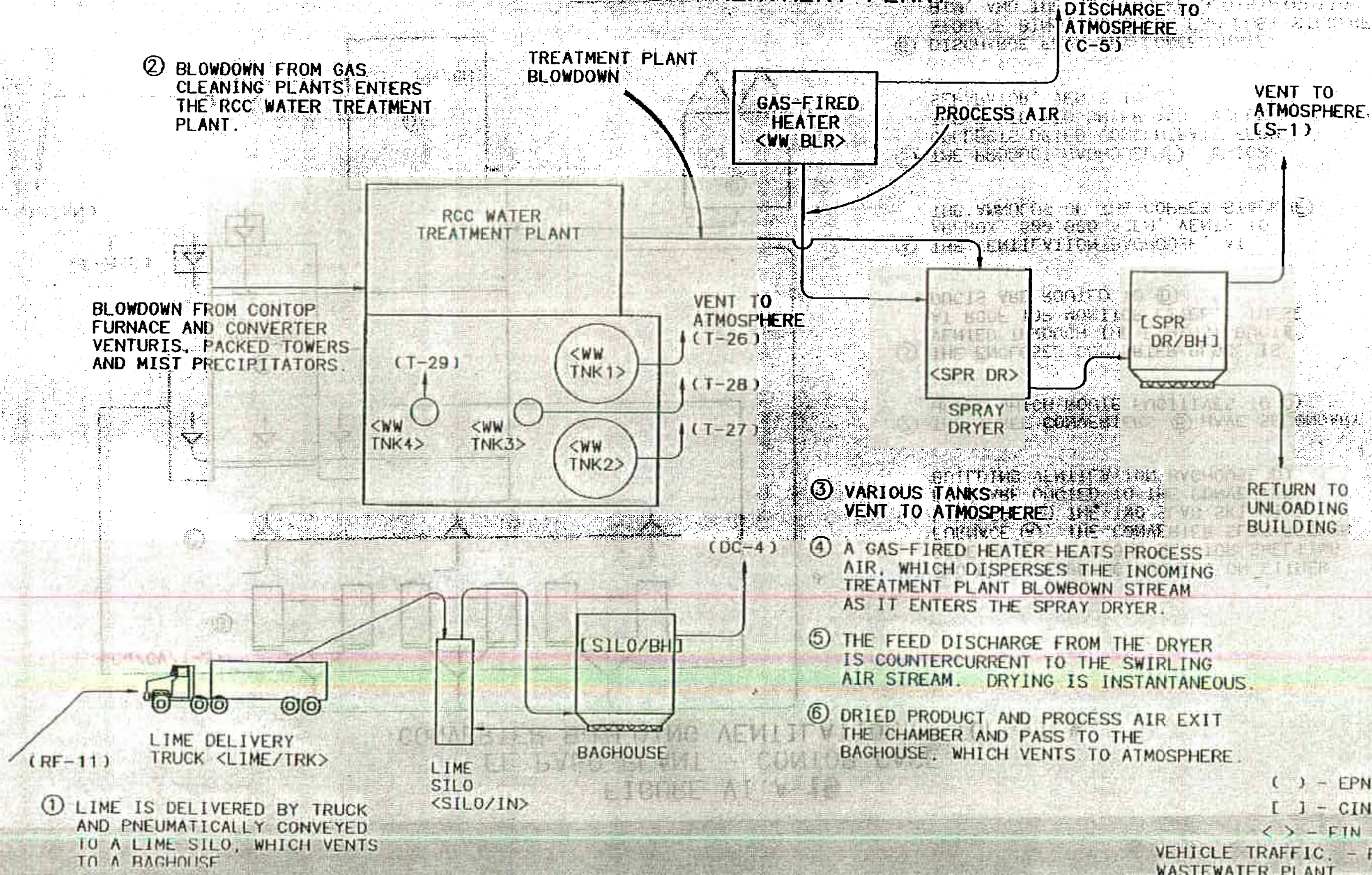
5. THE PRODUCT BAGHOUSE (F), WHICH COLLECTS DRIED CONCENTRATE FROM THE FLUID BED DRYER AND CYCLONE SEPARATOR, VENTS TO (E).

6. DISCHARGE FROM DRY CONCENTRATE STORAGE BINS, COTTRELL ESP DUST STORAGE BIN, AND THE REACTOR FEED DISTRIBUTION SYSTEM (G) ARE TIED INTO (D).

( ) - EPN
[ ] - CIN
<> - FIN

FIGURE VI.A-20

EL PASO PLANT - CONTOP MODIFICATION RCC WATER TREATMENT PLANT



Attachment C

ASARCO

Special Investigation Slides

Taken: April 11 and April 20, 2006

El Paso, Texas

Participated in Investigation:

TCEQ:	ASARCO:
Dois Webb	Larry Castor
Archie Clouse	Krishna Parameswaran
Kevin Smith	Lairy Johnson
Terry McMillan	
Jill Kelley	
Karl Rimkus	
Daniel Jamieson	

April 11, 2006

1. Oxygen Plant: ASTs with nitrogen gas for storage

4. Baghouse: North end on west side of building

8. Enclosed conveyance from Unloading Building (rear) to Bedding Building (forward)

10. Copper Stack Annulus

16. Conveyor Belt 10 (continued)

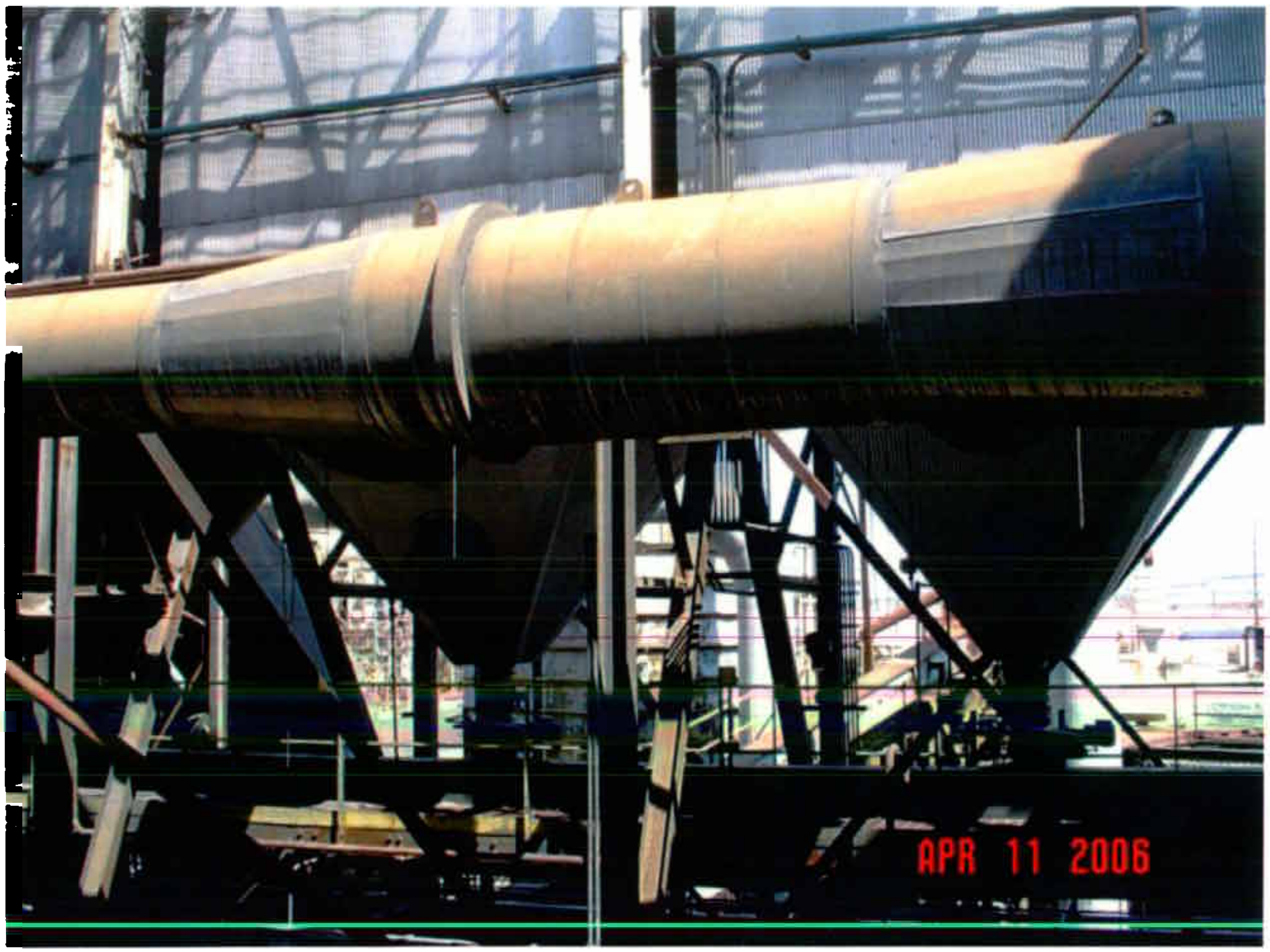
20. Ductwork overview (easterly)

22. Converter Building: Ventilation

26. Top of Dry Concentrate Storage Bins

28. Acid Plant No. 1 overview

33. Fluid Bed Dryer Baghouses (5 total)



34. Converter Building: North end

39. Anode Casting Room

40. Empty Sulfuric Acid Storage Tanks

43. Expansion joint on duct leading from CONTOP Waste Heat Boiler

44. Duct leading from CONTOP (left) to Acid Plant (right)

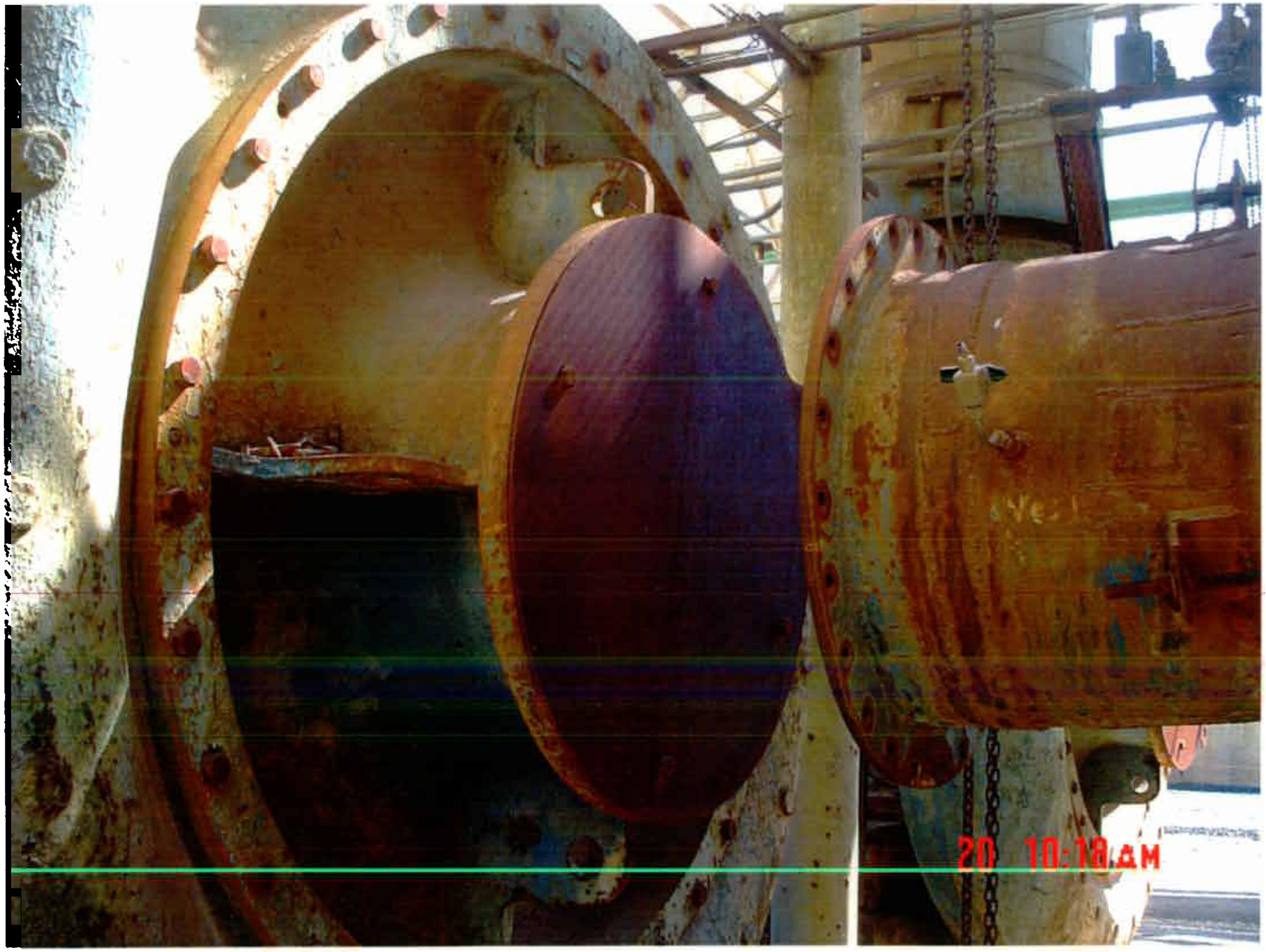
April 20, 2006

49. Slag Pots

50. Acid-packed Tower (Acid Plant No. 2)

52. Motor, Gearbox, Output Shaft, Blower Fan for Acid Plant No. 2

55. Sealing of Flue from Fan Assembly (Acid Plant No. 1)



65. Control Room for Converter #1

Attachment D

Nov 11, 1998
Revised: May 19, 1999
Revised: Apr 20, 2006

El Paso Copper Smelter Startup Plans

This outline is intended to be an overview of what will take place during the startup of the El Paso Plant. It does not cover the manning or strategies of the administrative parts of the Plant including:

- Management team
- Accounting departments
- Human Resources departments
- Laboratory department
- Environmental department

During the smelter shutdown in 1999, the entire Plant, including rotating equipment, flues, tanks, bins, and electronics, was carefully cleaned and placed in a mothballed state applicable to each individual piece of equipment. Startup will entail reversing much of what was performed in the mothballing operation as well as inspecting the equipment on a piece by piece basis to uncover any portions of the equipment that will have to be repaired prior to actual operation.

Of primary concerns is the hiring of skilled employees that will accomplish the successful startup and then to continue to operate the Plant in an optimal manner. It is expected that a large percentage of the employees that were working in 1999 will not be available for permanent rehire. The primary reasons for this will be age and retirement. And because of this situation it will be necessary to hire and train the majority of the workforce as being inexperienced in smelter operations.

The first step then will be to hire a competent and experienced person who will function as a front-line supervisor in each key area of the Plant:

- Acid Plant
- RCC Plant
- Oxygen Plant
- Powerhouse
- Contop Boiler
- Contop Furnace
- Converters
- Anodes
- Cottrells
- Unloading
- Machine and Boilermakers Shops

In addition, a key supervisor will be hired for the following crafts:

- Mason
- Electrical
- Instrumentation
- Master Mechanic

In each area where the above supervisors are not previously experienced at the El Paso Plant, an attempt will be made to hire an ex-Asarco employee as a consultant for that particular area.

To supplement the experience hired in each area, it is expected to be of benefit to contract with particular manufacturers service representatives. This will include:

RCC Plant (RCC)
Alhstrom Boiler (Contop)
Oxygen Plant (BOC)
Powerhouse Turbines (GE)
Distributed Control System (Foxboro)
Acid Plants (Monsanto or Koch)

In order to perform startup preconditioning of the equipment a contractor crew of varying size and skill will be employed. As permanent employees are hired and trained for the plant startup, these individuals will be used in place of contractors to the extent possible. It is expected to take three months to hire and train the production and maintenance workforce required for the startup. Simultaneously with this hiring training period will be inspections and preconditioning of the equipment.

In each of the areas of the plant the following general startup procedure will be use:
1.) The electric systems, including lights, substations, and circuit breakers will be turned on and inspected for proper working condition.
2.) Start and operate the Plants 90psi air compressor systems.
3.) De-mothball all gearboxes and other rotating equipment. This will primarily entail draining, rinsing, and refilling gearboxes throughout the plant to replace the special mothballing additives that were put into the appropriate equipment.
4.) Operate or turn, all rotating equipment to insure that bearings and lubrication systems are working properly. Replace any bearings as appropriate.
5.) Inspect all flues and expansion joints for integrity. Insure that each damper is able to move through its entire range of motion.
6.) Inspect all baghouse bags for integrity. Determine strength and porosity conditions of the bags in each baghouse by running pull and porosity tests. Replace bags as necessary.
7.) Turn on, individually, all cooling water systems and insure that flow is adequate and normal. Replace any valves that show indications of leaking or undue stiffness.
8.) Recalibrate all instrumentation field-measuring transmitters. Insure that distributive control systems are working properly and that all transmitter data is being received, archived, and displayed properly.
9.) Turn on individually all natural gas systems. Insure that all pilot lights are lit and working properly. Insure that all regulator diaphrams are intact and that the regulators are functioning properly.
10.) Operate all burners individually. Insure that all fail-safe systems are functioning properly.
11.) Check specific and general environmental permit conditions and insure that all conditions are being properly met.

There are several area-specific instructions for startup as follows:

-<u>Contop Furnace, Converters, and Anode Furnaces</u>

1.) Inspect all furnace brick and test for integrity. Use manufacturer's expertise for brick testing. Rebrick as appropriate.
2.) Load test and perform required crane inspections.
3.) If funding and time permits, install settling furnace modification (shortening) in order to decrease natural gas consumption.
4.) Screen anode casting gas reformer catalyst and test catalyst using manufacturer's recommended procedure.

-<u>Powerhouse</u>

1.) Reinstall turbines and test using manufacturer's service representative.

2.) Inspect and then operate marine boilers. [coordinate boiler inspections with the rest of the boilers in the Plant]

3.) Review new low-pressure converter air blower controls and insure that they operate properly.

4.) If time permits, complete and startup new superheater and de-aerator system.

5.) Insure that new plant water system is working properly. This system was installed after the Plant shutdown in 1999 as part of the new stormwater system. As such they have not been tested during actual Plant operations.

-<u>Acid Plants</u>

1.) Remove sealing blinds in contact sections of acid plant.

2.) Screen catalyst in all beds of the converters. Test catalyst reactivity.

3.) Reinstall packed scrubber packing, or install new packing if the stored plastic packing shows signs of deterioration.

4.) Inspect and replace cast iron piping in contact section of acid plant as appropriate.

5.) Inspect bricking lining in acid contact towers and repair as appropriate.

6.) Inspect, using manufacturer's service representative, the mist eliminators in the final and drying towers of both Plants. Replace or repair as appropriate.

7.) Test mist precipitator rectifiers and replace any star wires as appropriate.

-<u>RCC Plant</u>

1.) Inspect boilers [coordinate with Powerhouse boiler inspections]

-<u>Cottrells</u>

1.) Test cottrell rectifiers. Operate vibrators and replace any wires as appropriate.

-<u>Contop Boiler</u>

1.) Inspect Ahlstrom boiler with manufacturer's vendor. Inspect boiler in coordination with Powerhouse boiler inspections.

-<u>Instrumentation</u>

1.) Investigate the need to upgrade software for the distributed control system in order to be supported properly by Foxboro.

2.) Investigate the need to upgrade the contop modicon control system in order to be supported properly by Modicon.

-<u>Oxygen Plant</u>

1.) Utilize manufacturer's service representative to provide procedures for removing the nitrogen blanket in the cold tower, tanks, and associated equipment.

2.) Utilize main blower manufacturer's service representative to inspect and balance blower turbine stages.

3.) Startup and operate oxygen plant to produce liquid oxygen and fill storage tanks prior to Contop startup.

-<u>Unloading Department</u>

1.) Reinstall section of 10 belt that was removed during the removal of the sinter plant baghouse after 1999.

a.) If funding and time permits, decrease the number of conveyors to reduce conveyor transfer points (environmental) and decrease maintenance costs.

2.) Operate and inspect all conveyor belts. Replace conveyor belting as appropriate.

General Startup Guidelines:

1.) Prior to Contop startup insure that all major ancillary equipment is operation:

   a.) RCC Plant
   b.) Powerhouse and boiler systems
   c.) Plant water and compressed air systems
   d.) Oxygen Plant
   e.) Cottrell and baghouse systems

2.) Utilize a contractor (Hotworks) to preheat settling furnace. During this 5-day period, preheat converters, anodes, and acid plants to operating temperature.

3.) Startup contop concentrate drier and begin filling up dry bins approximately 4 hours before reactors are to start.

4.) Startup 1st contop reactor when furnace and all ancillary operations are ready. If all systems are operating properly, start the second contop reactor in approximately 1 hour.

5.) Begin matte tapping and converter operations within 8 hours of initial reactor startup.

6.) Operate anode and anode casting system when converters have provided enough feed material.